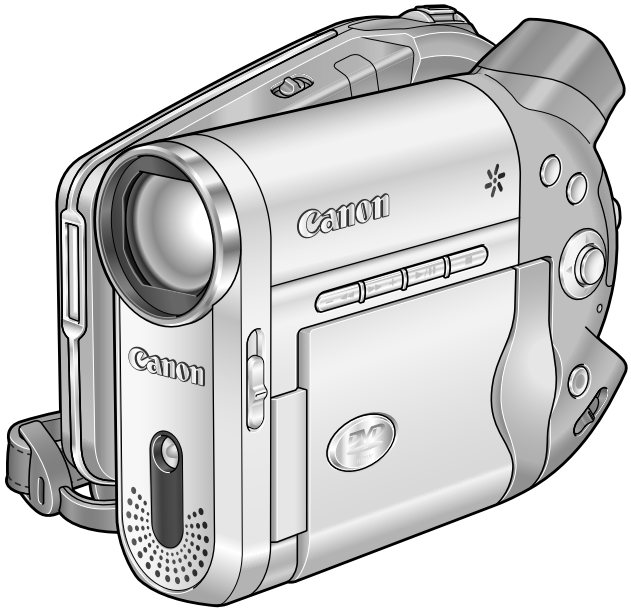
Canon Video Product

SERVICE MANUAL

DC10 E, DC20 E

No. D17-9213, 9313 Digital Video Camera

iPAL



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GENERAL DESCRIPTION OF PRODUCT

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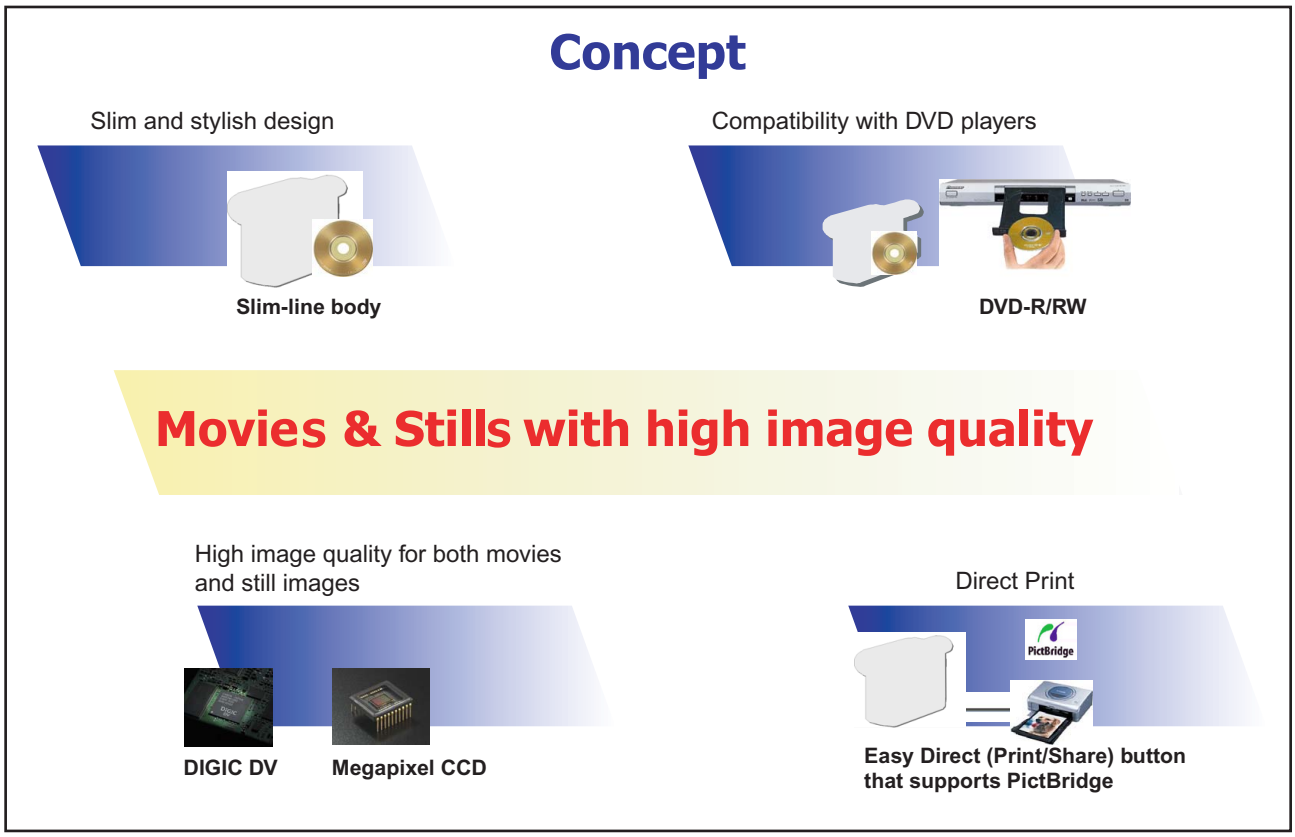
1. Product Overview

1-1 Development Concept



1-2 List of Main Features

1-2-1 High Image Quality

(1) Total pixels/CCD size

DC10 E : approx. 1.33-megapixel, 1/4-inch CCD (color correction filter) featured

DC20 E : approx. 2.20-megapixel, 1/3.9-inch CCD (primary color filter) featured

(2) Effective pixels

DC10 E

Still image (CARD/DISC)	:			Approx. 1.23-megapixel (1280 [H] × 960 [V])
Video (DISC only)	:	4:3	→	Approx. 860,000 pixels (1072 [H] × 804 [V])
		Widescreen TV (IS OFF)	→	Approx. 920,000 pixels (1280 [H] × 720 [V])
		Widescreen TV (IS ON)	→	Approx. 790,000 pixels (1184 [H] × 666 [V])

DC20 E

Still image (CARD/DISC)	:			Approx. 2.00-megapixel (1632 [H] × 1224 [V])
Video (DISC only)	:	4:3	→	Approx. 1.77-megapixel (1536 [H] × 1152 [V])
		Widescreen TV (IS OFF)	→	Approx. 1.50-megapixel (1632 [H] × 918 [V])
		Widescreen TV (IS ON)	→	Approx. 1.38-megapixel (1568 [H] × 882 [V])

(3) High-performance, high-magnification zoom lens included

Optical magnification ---------- 10×

Nominal focal length ---------- 4.05 - 40.5 mm

35 mm film equivalent (at 4:3) ---------- DC10 E : Approx. 46.7 - 467 mm

---------- DC20 E : Approx. 40.6 - 406 mm

* Lens configuration (same as MVX1 Si E, MVX1 S E)

Lens configuration of 11 elements in nine groups with one aspherical lens used (double-sided aspherical lens), gradation ND incorporated, F/1.8 to 2.8

(4) DIGIC DV video engine included

1-2-2 Advanced Functions and Comfortable Operation

Shooting Functions

(1) Camera mode

1) Disc movie mode, 2) disc still image mode , 3) card still image mode

Provided as options for the movie mode in 1) are the XP high-image-quality mode (approx. 20 minutes), SP normal mode (approx. 30 minutes), and LP long-play mode (approx. 60 minutes).

(2) Discs supported

8 cm DVD-R/-RW discs

(double-sided type: 2.8 GB/single-sided type : 1.4 GB)

(3) Video recording specification

Movie

DVD-RW : DVD Video Recording (VR mode) and DVD-VIDEO (VIDEO mode).

DVD-R : DVD-VIDEO (VIDEO mode) only.

Compression method / movie : MPEG2

Audio:Dolby Digital 2 channels (AC-3 2 channels) [ ]

Still image

Exif Ver2.2 compliant(DPOF not supported by discs) , Compression method:JPEG

(4) Many program AE options (same as MVX1 Si E, MVX1 S E but a 3-position slide switch is featured)
1) AUTO, 2) P (P, Tv, Av mode), 3) SCN
SCN (special scene) mode can be selected to enable optimum shooting of the eight types of scenes below.
<1> Portrait : This is used to defocus the background to set off the subject to be shot.
<2> Sports : This is used to shoot fast-moving subjects during tennis matches and games of golf, for instance.
<3> Night : This enables subjects to appear lighter in color even at night time or when the scene is otherwise dark.
<4> Snow : This prevents the subject from appearing too dark and enables it to be shot clearly on the ski slopes in winter where the glare from the snow is strong.
<5> Beach : This prevents the subject from appearing too dark and enables it to be shot clearly on the beach in summer where the glare from the water is strong.
<6> Sunset : This enables sunsets to be shot brightly and in vivid color.
<7> Spotlight : This enables sharper shooting of scenes lit by a spotlight or other light source.
<8> Fireworks : This enables the shooting of fireworks.

(5) In addition to the MENU button, a FUNC. button is now provided, which enables setting of the following functions.
Camera mode
* Program AE (P), shutter-priority AE (Tv), aperture-priority AE (Av), and the “special scene” settings <1> through <8> described above.
* Photometry system settings (evaluative photometry, center-weighted average photometry and spot photometry ... P position during still image shooting),
* White balance (Auto, Daylight, Shade, Cloudy, Tungsten, Fluorescent, Fluorescent H, Set),
* Image effects (Vivid, Neutral, Low sharpening, Soft skin detail, Custom),
* Drive mode settings (single shooting, continuous shooting, high-speed continuous shooting, AEB, stitch assist) --- in card still image mode only,
* Image quality mode setting (XP, SP, LP)
* Faders (in movie recording mode only), * Effects (in camera mode only),
* Multi-screen settings (in movie recording mode only), * Card Mix, * Still image simultaneous recording settings,
* Image size settings, * Still image quality settings

During still image playback mode
* Erase image , * Image protect, * Slideshow, * Print selection (in card still image mode only),
* Transfer selection (in card still image mode only), * (Photo) movie conversion (in disc still image mode only)

During video playback
Original : * Divide, * Delete, * Add to playlist
Playlist : * Move, * Divide, * Delete,

(6) Mini-video light included (DC20 E only)
This light has about three times the lighting capability of the white LED used on previous models, enabling close-up subjects to be shot even in the dark.
It can be turned on by pressing a button in any program mode. Furthermore, even in the night mode, it can light up (mini video light priority) just as the conventional white LED could.

(7) Includes 2.5-inch, 123,000-pixel, TFT color LCD monitor
Includes BACKLIGHT button
Employing ultra-high-brightness LEDs (× 3) yields higher brightness levels, smaller dimensions, reduced power consumption, and greater environmental friendliness.
An AG (anti-glare) + AR (anti-reflection) coating is provided to enable easy visibility of the subject even when viewing the LCD screen under direct sunlight.
While keeping the gradient reproducibility the same for the white side, the black side was narrowed to improve the contrast, and the LCD image quality is switched based on changes in camera image quality when switching modes for allowing smooth transition between the image quality of movies and still images.

(8) Wind screen (WS) function (ON/OFF)

(9) Exposure compensation
Exposure locking by operating omni selector (top). Also, the exposure can be adjusted to a maximum of ±11 levels (±2.75EV) by moving the omni selector to the left and right.

(10) Auto slow shutter function (set by the MENU button)
The slow-side shutter speeds for Auto mode were expanded.
During movie : 1/50 sec → 1/25 sec
During still image : 1/25 sec → 1/12.5 sec
This enables shooting of subjects in low brightness.
(11) Widescreen TV (WIDE SCREEN) shooting (16:9)

Functions for Recording Still Images on Cards and Discs (Movie Cannot be Recorded on Cards)

(1) miniSD card used (same as MVX1 Si E, MVX1 S E)
(2) 9-point range-finding frame AiAF function
Includes Ai (Artificial intelligence) AF function where the camera automatically selects from 9 range-finding frames on the screen in Disc/Card Camera mode.
The range-finding frame can be switched between the automatic selection function and center range-finding frame.
AUTO mode is AiAF only. (Selection of the range-finding frame is not possible.)
(3) Metering system (same as MVX1 Si E, MVX1 S E)
In P, Tv, and Av modes, the metering system can be selected from evaluative metering, center-weighted average metering, and spot metering (spot metering is center frame only).
(4) Still image sizes (for both cards and discs)
1632 × 1224 (DC20 E only), 1280 × 960, 640 × 480, Super fine, Fine, Normal can be set.
(5) Continuous shooting function (in card still image mode only)
VGA : Up to 60 continuous frames can be shot at high-speed and normal continuous.
(6) AEB shooting (in card still image mode only)
Enables shooting of 3 frames with automatic changes in exposure (Normal, -0.5EV, +0.5EV).
This allows the user to select the optimal exposure from the 3 frames afterward.
The main differences between the disc still image mode and card still image mode are as follows.

	Continuous shooting	High-speed continuous shooting	AEB	DPOF compatibility	Protect	Transfer order	Photo stitch
Disc still image mode	×	×	×	×	×	×	×
Card still image mode	●	●	●	●	●	●	●

(7) Built-in flash (light guide flash) included (DC20 E only)
(8) Still image check time setting (in card still image mode only)
After releasing the Photo button, the display time can be set (6 levels) for checking the still images.
(9) Still images (640 × 480) can be recorded on cards by operating the Photo button during disc movie shooting (this cannot be done during playback).

Comfortable Operation/Miscellaneous

(1)

(2)

(4)

(1) New omni selector adopted
(2) Finalize button included
(3) Lens cover incorporated inside the body (same as MVX1 Si E, MVX1 S E)
(4) PRINT/SHARE button included
When connected to a Direct printer, pressing the button when it is lit blue will print the still image displayed on the LCD monitor.
When connected to a computer, files selected on the LCD monitor can be transferred.
Also, the contents of finalized 8 cm discs can be recorded onto 12 cm discs loaded inside the PC. (Refer to Roxio My DVD for Canon.)
(5) Direct Print (supported in both card still image and disc still image modes)
PictBridge-compatible printers only
(6) DPOF print selection (image transfer is also possible)...in card still image mode only
(7) Exif 2.2 (Exif Print) compliant (supported in both card still image and disc still image modes)
(8) New compact remote control
Omni selector featured, lithium battery CR2025 used, remote control sensor settings not possible (ON/OFF only)
(9) Battery charging function
(10) Display of Digital Effects/Fade animation (only in disc movie recording mode; no display during playback)
When the Digital Effects/Fade function is to be selected, the function effects are displayed (previewed) using animations so the special effects best suited to the scenes can be selected, and shooting (playback) can be performed with those effects added.
(11) Playback zoom: Max. 5× zoom (still image only)
(12) 10 languages supported :German, English, Spanish, Italian, Russian, French, Chinese (simplified), Chinese (traditional), Korean, and Japanese
(13) Built-in rechargeable lithium backup battery
(14) Disc initialization function
Function that displays the disc initialization menu to enable the VR mode or VIDEO mode to be selected and used when an unformatted disc is loaded. Only the VIDEO mode can be selected for DVD-R discs which are automatically initialized in the VIDEO mode after they have been recognized.
(15) Function for copying still images from cards to discs and vice versa (function for copying all images provided)
(16) Disc editing functions :

1. Original image editing: Function for editing original images (scenes) in VR mode recording.
scenes can be deleted or divided or adding to Playlist.
Note : This technical document defines a scene as a single shot which extends from when the record button is initially pressed to when it is pressed again to stop the recording.
2. Playlist editing (in VR mode recording) / (* Refer to the technical description P.21)
A playlist is defined as a list of scenes which are arranged in the desired playback sequence and whose images are displayed as thumbnails (6 thumbnails per screen).
All the editing functions of the original images and playlist images listed in the table below can be used.
The original images remain unaffected even when the playlist is edited.

	Original image editing	Playlist editing
Delete scene (Note)	●	●
Divide scene	●	●
Move scene	-	●
Adding to playlist	●	-
Delete all playlist	-	●

Note : When images are recorded in the DVD-VIDEO mode (-RW disc), only the scene which has just been shot can be deleted.

3. Disc title : Function for giving each disc a name (consisting of alphanumerics and symbols); up to 20 characters can be input per name. If the disc has not been finalized, titles can be added to all discs and in all recording modes.
4. Disc protection function: Function for protecting what has been recorded or edited on a disc by disabling further recording or editing. However, discs can still be initialized.
5. Creating Photo movies: Function for converting still images (JPEG compressed) on discs into MPEG movies. Playlists can be edited, and the movies can be played back on a DVD player. Function for creating collections of Photo movies provided.

(17) Execute/release finalizing (finalizing can be released only for DVD-RW discs)

(18) Accessories (same as MVX1 Si E, MVX1 S E)

Tele-Converter TL-H27, Wide Converter WD-H27, Filter Set FS-H27U

Battery Pack BP-208 (850 mAh), Battery Charger CG-300 (E), Multi Cable MTC-100

(19) “MY DVD software” (Roxio MyDVD for Canon)

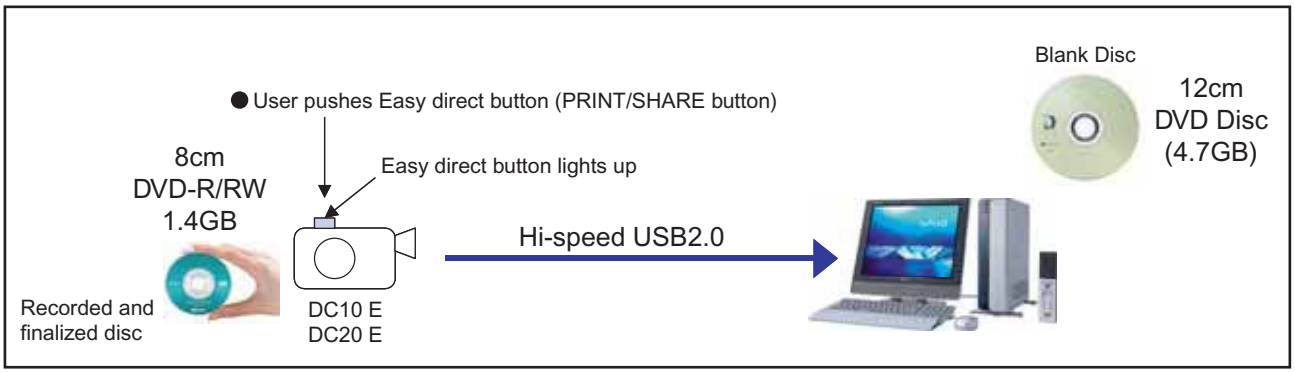
This software makes it easy to burn original DVDs on home-use personal computers.

It makes it possible to import video and sound from a DVD camera and burn DVDs which can then be played back on a DVD player purchased on the market.

For more details on these functions, visit the Japanese site at http://www.sonicjapan.co.jp/index.html or the U.S. site at http://www.sonic.com/default.asp.

Also joining the ranks of above functions is another function (One-Touch Dubbing) for recording data on the DVD disc in a PC simply by operating the Easy Direct (PRINT/SHARE) button on the body provided that the camcorder and PC are connected by the USB interface (Hi-Speed class supported).

This function works only with the Windows XP and subsequently released PC operating systems. Furthermore, it operates on condition that the disc inside the DC10 E, DC20 E has been finalized and that a blank disc has been loaded into the PC’s DVD drive.



1-3 Product Specifications Comparison Chart

Specifications		DC10 E	DC20 E
Lens	Movie	Lens10× optical zoom	
	Still image	Lens10× optical zoom	
CCD		1/4-inch, 1.33-megapixel color correction filter	1/3.9-inch, 2.2-megapixel RGB primary color filter
Image stabilizer		Electronic system (number of effective pixels 850,000 pixels)	Electronic system (number of effective pixels 1.77-megapixel)
Monitor		2.5-inch, 123,000-pixel LCD monitor	
EVF		0.3-inch, 123,000-pixel color viewfinder	
High-resolution 16:9		Wide-screen display	
Flash unit built into body		-	Light-guide flash unit
White LED		-	Mini video light
DISC		8cm DVD-R/-RW	
	Still image recording	1280 × 960 (approx. 1.23-megapixel)	1632 × 1224 (approx. 2.00-megapixel)
	Movie recording	MPEG2 (3/6/9Mbps)	
Memory card		mini SD Card	
	Still image recording	1280 × 960 (approx. 1.23-megapixel)	1632 × 1224 (approx. 2.00-megapixel)
	Movie recording	-	
USB		USB2.0 High Speed	
	Streaming	-	
	Direct Print	PictBridge supported only	
Headphone/ microphone terminal		-	
AV/S input/output terminal		Multi Cable MTC-100 (no line input)	
Battery included with unit		BP-208 (850mAh)	

Functions deleted from past Video Cameras	No DV terminal, analog-to-digital conversion function, still image digital zoom function, audio dubbing, My Camera function or audio level display

1-4 Function and Performance List

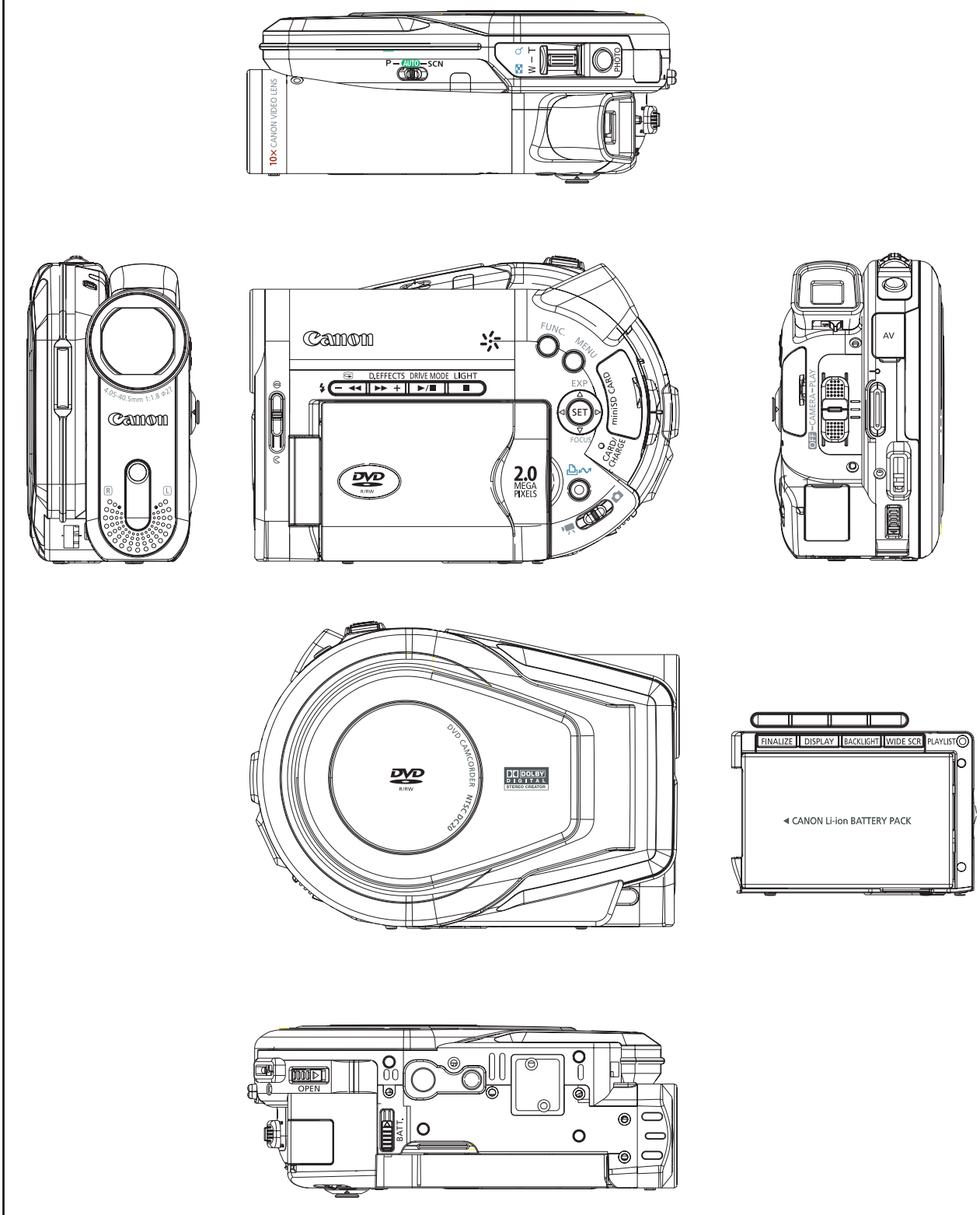
Item				DC10 E	DC20 E
Camera					
Image sensor	Image size			1/4-inch CCD	1/3.9-inch CCD
	System (filter)			Interlacing (Color correction filter)	Interlacing (RGB primary color filter)
	Total pixels			1.33-megapixel	2.20-megapixel
	Number of effective pixels		Movie	Approx. 850,000 pixels (4:3)	Approx. 1.77-megapixel (4:3)
			Still image	Approx. 1.23-megapixel	Approx. 2.00-megapixel
Lens	Nominal focal length			4.05 to 40.5 mm	
	Optical zoom magnification			10×	
	Digital zoom magnification	Magni-fication	Movie	40×/200× (selectable)	
			Still image	×	
		System		CCD readout	
	F number			F1.8 to 2.8	
	Aperture leaves (Number of leaves)			2 leaves	
	Zoom speed			Continuously varying speed	
	Filter diameter			27mm P0.5	
Noise reduction	Camera		Movie	Either CCD-NR or Y/C-NR	
			Still image	Chroma-only, median filter	
	Recorder			C-NR system	
Minimum illumination	Auto mode (with auto slow shutter selected)			6 lx	14 lx
	Night mode			0.5 lx	1.3 lx
Image stabilizer	Image stabilization system			Electronic system	
	Sensing method			Angular velocity sensing	
Shooting functions					
AE mode	Program AE			AUTO, P, Av, Tv, Portrait, Sports, Night, Snow, Beach, Sunset, Spotlight, Fireworks	
Photometric system	Center weighted average photometry		Movie	AUTO, P, Av, Tv, Portrait, Sports, Night	
	Evaluation photometry (128-segments) + All area photometry		Movie	Spotlight, Snow, Beach, Sunset	
	No photometry		Movie/ Still image	Fireworks	
	Evaluation photometry (128-segments)		Movie	AUTO, Portrait, Sports, Night	
	Evaluation photometry (128-segments) + All area photometry		Still image	Spotlight, Snow, Beach, Sunset	
	Photometry options		Still image	Av, Tv, P mode (Selectable from evaluative photometry, center-weighted average photometry, and spot photometry)	
Exposure adjustment	AE lock			● Omni selector up button operation (Prohibited during AUTO mode)	
	AE shift			×	
	Exposure correction			● Correction by right and left operation of the omni selector (± 11 steps)	
	Gain setting/Higher sensitivity			Auto	
	Backlight correction			×	

Item				DC10 E	DC20 E
Shooting functions					
Shutter speed	Shutter speed setting (in Tv mode)		Movie	9 levels (1/6, 1/12.5, 1/25, 1/50, 1/120, 1/250, 1/500, 1/1000, 1/2000)	
			Still image	9 levels (1/2, 1/3, 1/6, 1/12.5, 1/25, 1/50, 1/120, 1/250, 1/500)	
	Auto mode		Movie	1/25 to 1/500 sec (with auto slow shutter ON), 1/50 to 1/500 sec (with auto slow shutter OFF)	
			Still image	1/12.5 to 1/500 sec (with auto slow shutter ON), 1/25 to 1/500 sec (with auto slow shutter OFF)	
	Low Light mode			None	
	Night mode			1/2 to 1/500 sec (Disc/Card)	
Aperture value (in Av mode)				Auto iris (F1.8, 2.0, 2.4, 2.8, 3.4, 4.0, 4.8, 5.6, 6.7, 8.0, 9.5,11, 14, 16)	
Auxiliary light source	Flash			×	Built-in model, accessory shoe not supported
	Video light (external)			Not supported	
	Mini video light			×	Built-in (when flash is used, Red-eye Reduction function provided; low-luminance AF auxiliary light)
Image quality adjustment	Image effects functions			● (Vivid, Neutral, Low Sharpening, Soft Skin Detail)	
	Custom functions			● (Brightness, Contrast, Sharpness, and Color Depth)	
White balance	Auto			●	
	Preset			Daylight, Shade, Cloudy, Tungsten, Fluorescent, Fluorescent H	
	Systems			TTL, 128 segments	
Focus	Mode			AF/MF, forced infinity	
	Correction means			Right and left operation after pressing the omni selector down button	
	Range finding frame display		Movie	×	
			Still image	● (AiAF selection: 9-point range-finding frame display, center only display when center selected)	
Zoom	Speed			Continuously variable speed (no levels) supported	
Widescreen TV (WIDESCREEN)	Recording system		Movie	● (High image quality 16:9)	
			Still image	×	
	Letterbox display			●	
Digital fade (Camera mode only)			Movie	Auto Fade, Wipe, Corner Wipe, Jump, Flip, Puzzle, Zigzag, Beam, Tide	
			Still image	×	
Digital effects (Camera mode only)			Movie	Art, Black & White, Sepia, Mosaic, Ball, Cube, Wave, Color Mask, Mirror	
			Still image	Black & White	
Card mix (Camera mode only)			Movie	Lumi. key/Chroma key/Camera Chroma key/Animation (Corner Animation, Straight Animation and Random Animation)	
			Still image	×	
Multi-screen (Camera mode only)			Movie	● (Disabled in Auto mode and Night mode)	
			Still image	×	
	Capture speed		Shutter speed ≧ 1/25sec	Manual, Fast (4 fields), Normal (6 fields), Slow (8 fields)	
			Shutter speed < 1/25sec	Manual, Fast (4 fields), Normal (8 fields), Slow (12 fields)	
	Multi-screen			4 / 9 / 16	
Movie shooting	Mode		Disc	8 cm DVD-R/-RW disc (double-sided type : 2.8 GB/single-sided type: 1.4 GB), No-cartridge type	
			Card	Not possible	

Item			DC10 E	DC20 E
Shooting functions				
Still image recording	Compression method		JPEG	
	Single image		●	
	Continuous shooting (card recording only)		●	
	AEB (card recording only)		● Exposure correction amount (steps of ±0, -0.5, +0.5)	
	Photo button	Form	Dedicated still image button	
		Pressed halfway down	● (Only during recording standby)	
	Recording image size		1280 × 960, 640 × 480	1632 × 1224, 1280 × 960 640 × 480
	Image quality		Super Fine, Fine, Normal	
	External flash compatible		×	
	Frame processing		●	
Negative-positive reversal			×	
Zebra pattern			×	
Color bar			×	
Self-timer			10 sec	
Interval timer			×	
Clear scan			×	
Memory card			miniSD memory card	
REC Search			●	
REC Review			●	
Standby switch			×	
Power saving function (after recording has been continuously paused for 5 minutes)			ON/OFF setting possible	
Displayed text recording			×	
Audio	Movie		Dolby Digital 2 ch (AC-3 2 ch)	
Wind screen			● ON/OFF setting (Built-in microphone only)	
EVF	Size		0.33-inch (TFT color)	
	Pixels		123,000 pixels	
	Brightness adjustment		×	
	Color adjustment		×	
	Movable		×	
LCD monitor	Size		2.5-inch	
	Pixels		123,000 pixels	
	Brightness adjustment		●	
	Movable		● Mirror shooting supported	
PLAY mode				
Playback system	Frame playback		×	
	Slow playback (VR mode only)		Forward / Reverse (±1/2, ±1/4, ±1/8, ±1/16 speed)	
	Forward direction scan		1.5× (with audio), 5×, 15×, 25× speed	
	Reverse direction scan		2.5×, 5×, 15×, 25× speed	
	1× SP playback		Forward / Reverse	
	Skip		●	
Search	Photo search		×	
	Date search		×	
	Index search		×	
	End search		×	

Item			DC10 E	DC20 E
PLAY mode				
Playback effects	Playback zoom (5× zoom)		● (Not possible during still image playback and movie playback)	
	D. effects	Movie	×	
		Still image	×	
	D. fade	Movie	×	
		Still image	×	
	Multi screen		×	
Data code display			Date display/Camera data display	
Card	Slide show		●	
	Playback frame jump		●	
Audio dubbing			×	
AV insert			×	
Zero set memory			×	
Editing functions	Original image editing (VR mode)		● (Adding to Playlist, Delete, Divide)	
	Playlist editing (VR mode)		● (Delete, Divide, Move, Delete All)	
	Enter disc title		●	
	Disc protect		●	
	Create photo movie		●	
System				
Interface (terminal)	Microphone input		×	
	Headphone output		×	
	DV terminal		×	
	S-Video terminal		Output only, multi-jack	
	AV terminal		Output only, multi-jack	
	Editing terminal		×	
	USB terminal		mini-B Receptacle	
Memory card file transfer			● (USB file transfer)	
Analog signal → DV signal conversion			×	
Direct print			● (PictBridge-compatible printers only)	
Easy Direct (PRINT/SHARE) button			●	
Microphone attenuation			×	
Microphone level meter			×	
World clock			●	
Text titles			×	
Speaker			●	
Confirmation beep			●	
Tally lamp			×	
Remote control sensor			●	
Accessory shoe			×	
Video ID			×	
Custom keys			×	
Night mode key			×	
DV control			×	
My Camera			×	
Internal battery charging			● (CA-570 connected)	
Backup power supply			Built-in (rechargeable lithium battery)	
Battery pack power			BP-208 lithium ion battery	

● External View



Note : Figure shows DC 20 E.
External differences from DC10 E : Only the flash and the mini video light in the front.

Fig. 1

2. Technical Explanation

2-1 Design Concept

The photograph shows DC20 E.

* Circle grip styling for superior operability.

Circle grip with a key positioned at the arc of the disc area.
Fits snugly in the user's hand to assure superior operability.

* Distinctive and attractive rounded rear shape.

Design where the cylindrical shape of the lens continues from the front right through to the rear panel along the arc of the disc area.
A sense that discs are used (which is distinctly different from tapes) felt when the semicircular rear cover is viewed from the LCD (right) side.

NTSC,PAL DC20 A/E		JAPAN DM-DC20	
DC10 A/E		**DM-DC10**	

Differences in external appearance between DC10 E and DC20 E
1. Paint color used for rear cover
2. Grip cover (DC20 E : painted; DC10 E : not painted)

Differences in appearance by market
The coloring of DC10 E and DC20 E is the reverse of the Japanese specification in overseas markets.

2-2 TS Mech

The TS Mech is the DVD drive newly developed for DVD cameras. It consists of a mechanical section and a control board.

		TS Mech
Size	Depth	70 mm
	Width	84 mm
	Height	14.3 mm
Weight		100 g
Playback/recording speed		2 ×
Usable disc		DVD-R, DVD-RW (1.4 GB, 8 cm)

2-2-1 Overview of TS Mech

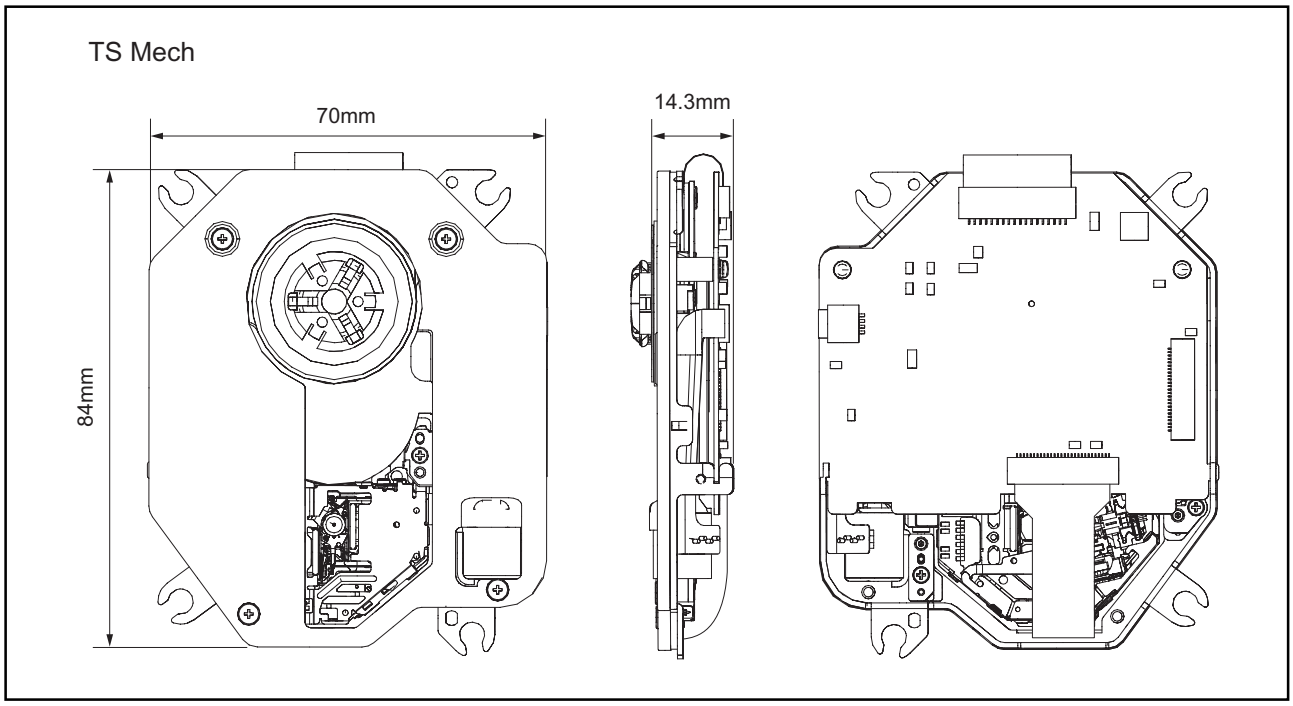


Fig. 2

2-2-2 Main Mechanical Parts

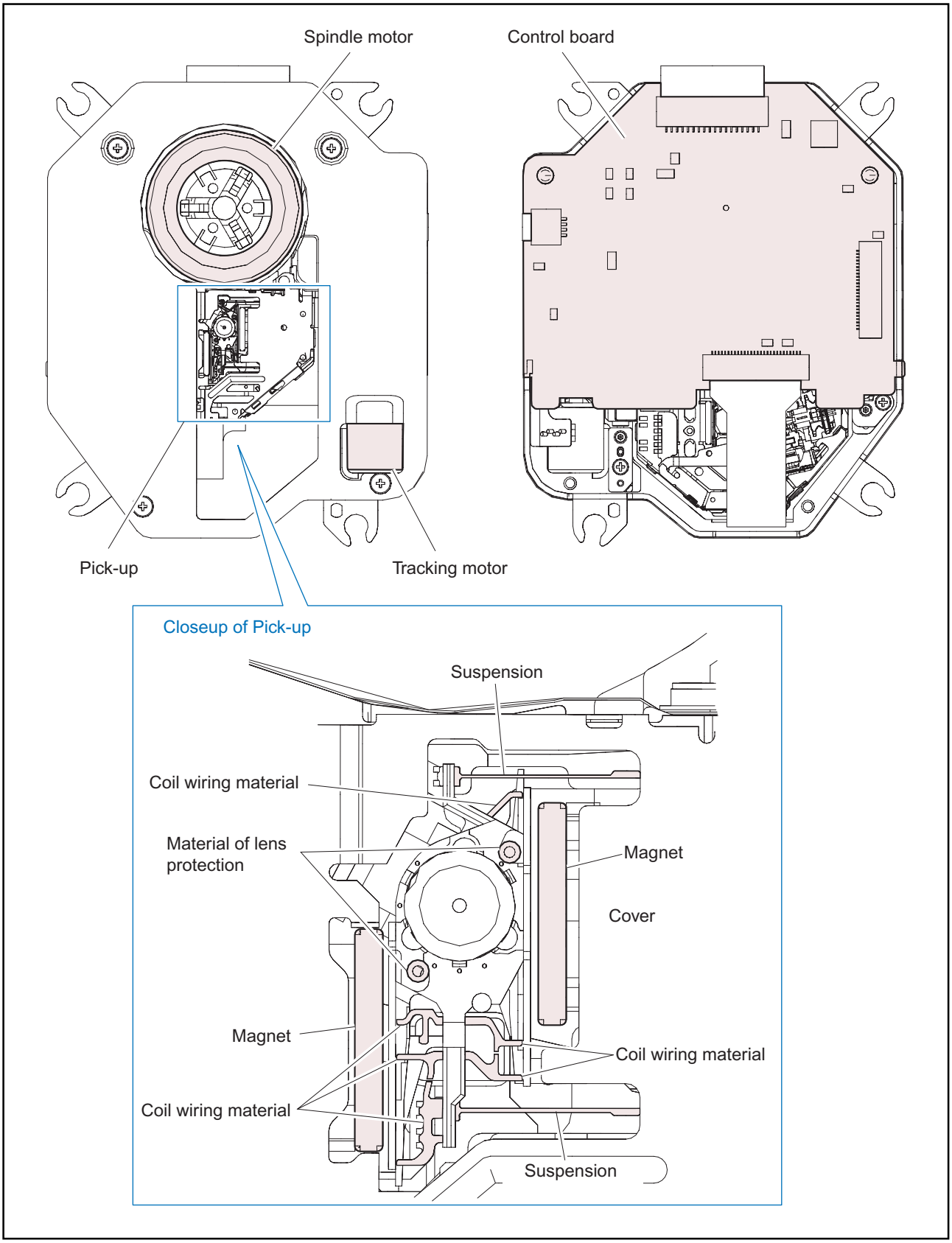


Fig. 3

3. Performance

	DC10 E, DC20 E
1 Type	DVD video camera
2 DVD recording modes	
2-1 Movie	Either DVD-Video Recording (VR mode) or DVD-VIDEO (VIDEO mode). DVD-R discs support DVD-VIDEO only. Movie compression method: MPEG2, Audio compression method: Dolby Digital 2ch (AC-32ch) [DOLBY DIGITAL STEREO CREATOR]/sampling frequency 48 KHz
2-2 Still Image	Complies with Exif Ver 2.2 (disc does not support DPOF), compression method : JPEG
3 Recordable discs	8 cm DVD-R/-RW discs (double-sided type : 2.8 GB/single-sided type: 1.4 GB) DVD R/RW *After shooting is completed for one side of a double-sided DVD, it is turned over and used.
Estimated movie recording time	*1 : VBR stands for Variable Bit Rate.

Recording mode	Average bit rate	Movie recording time (double-sided : 2.8 GB/single-sided : 1.4 GB)
XP (High image quality)	Approx. 9 Mbps (VBR *1)	Approx. 40 minutes / Approx. 20 minutes
SP (Standard)	Approx. 6 Mbps (VBR)	Approx. 60 minutes / Approx. 30 minutes
LP (Long play)	Approx. 3 Mbps (VBR)	Approx. 120 minutes / Approx. 60 minutes

4 Continuous battery shooting time/Actual shooting time, Continuous playback time

*1 : “Normal” refers to the LCD brightness at the Normal setting.

*2 : “Bright” refers to the LCD brightness at the Bright setting.

		DC10 E				
		When viewfinder is used		When LCD monitor is used		
		Continuous recording	Actual recording	Continuous recording	Actual recording	Continuous playback
BP-208	XP	Approx.75min	Approx.35 min	Approx. 70 min (Normal*1) Approx. 70 min (Bright*2)	Approx. 35 min (Normal) Approx. 35 min (Bright)	Approx. 80 min (Normal)
	SP	Approx.80 min	Approx.40 min	Approx. 80 min (Normal*1) Approx. 75 min (Bright*2)	Approx. 40 min (Normal) Approx. 40 min (Bright)	Approx. 90 min (Normal)
	LP	Approx.95 min	Approx.45 min	Approx. 90 min (Normal*1) Approx. 85 min (Bright*2)	Approx. 45 min (Normal) Approx. 40 min (Bright)	Approx. 100 min (Normal)

		DC20 E				
		When viewfinder is used		When LCD monitor is used		
		Continuous recording	Actual recording	Continuous recording	Actual recording	Continuous playback
BP-208	XP	Approx.65min	Approx.35 min	Approx. 60 min (Normal*1) Approx. 60 min (Bright*2)	Approx. 30 min (Normal) Approx. 30 min (Bright)	Approx. 75 min (Normal)
	SP	Approx.70 min	Approx.35 min	Approx. 70 min (Normal*1) Approx. 65 min (Bright*2)	Approx. 35 min (Normal) Approx. 30 min (Bright)	Approx. 80 min (Normal)
	LP	Approx.80 min	Approx.40 min	Approx. 75 min (Normal*1) Approx. 75 min (Bright*2)	Approx. 35 min (Normal) Approx. 35 min (Bright)	Approx. 90 min (Normal)

5 Camera			
5-1 Image sensing device			DC10 E : 1/4-inch interlaced CCD DC20 E : 1/3.9-inch interlaced CCD
5-1-1 Total pixels			DC10 E : Approx. 1.33-megapixel DC20 E : Approx. 2.20-megapixel
5-1-2 Effective pixels			
Still image (CARD/DISC)			DC10 E : Approx. 1.23-megapixel (1280 [H] × 960 [V]) DC20 E : Approx. 2.00-megapixel (1632 [H] × 1224 [V])
Movie	4:3		DC10 E : Approx. 850,000 pixels (1067 [H] × 800 [V]) DC20 E : Approx. 1.77-megapixel (1536 [H] × 1152 [V])
	16:9 (IS OFF)		DC10 E : Approx. 920,000 pixels (1280 [H] × 720 [V]) DC20 E : Approx. 1.50-megapixel (1632 [H] × 918 [V])
	16:9 (IS ON)		DC10 E : Approx. 790,000 pixels (1184 [H] × 666 [V]) DC20 E : Approx. 1.38-megapixel (1568 [H] × 882 [V])
5-1-3 Filter			DC10 E : Color correction filter DC20 E : RGB primary color filter
5-1-4 Signal configuration			PAL standard color TV signal
5-1-5 Scanning system			625 lines, 50 fields / 25 frames
5-1-6 Minimum subject illumination			
Auto mode			DC10 E : Approx. 6 lx (Shutter speed 1/25 sec) DC20 E : Approx. 14 lx (Shutter speed 1/25 sec)
Night mode			DC10 E : Approx. 0.5 lx (Shutter speed 1/2 sec) DC20 E : Approx. 1.3 lx (Shutter speed 1/2 sec)
5-1-7 Subject illumination range			DC10 E : Approx. 0.5 lx to approx. 100,000 lx DC20 E : Approx. 1.3 lx to approx. 100,000 lx
5-2 Photo lens			
5-2-1 Nominal focal length			4.05 - 40.5 mm Optical 10× zoom
5-2-2 35 mm film equivalent			
Still image			DC10 E : Approx. 38.9 - 389 mm DC20 E : Approx. 38.1 - 381 mm
Movie	4:3 mode		DC10 E : Approx. 46.9 - 469 mm DC20 E : Approx. 40.6 - 406 mm
	Widescreen TV (16:9)		
	IS-OFF		DC10 E : Approx. 42.6 - 426 mm DC20 E : Approx. 41.6 - 416 mm
	IS-ON		DC10 E : Approx. 46.1 - 461 mm DC20 E : Approx. 43.3 - 433 mm
5-2-3 Nominal diametric ratio			F1.8-2.8
5-2-4 Lens configuration			11 elements in 9 groups including one aspherical lens (double-sided aspherical lens) and gradation ND featured
5-2-5 Focus adjustment			Inner focus type. Manually adjustable (adjusted by SET dial)
5-2-6 Minimum object distance			10 mm (AF linked ; wide end), 1 m for full zoom area (from lens tip)
5-2-7 Power zoom			Power zoom supporting continuously variable speed (no levels). Slide lever operation. Zoom speed can be adjusted by moving slide lever.
Zoom speed (Tape recording)			
Optical zoom			REC : Approx. 1.8 sec to approx. 30 sec, PAUSE : Approx. 1.1 sec to approx. 30 sec
Electronic zoom			REC : Approx. 2.6 sec to approx. 32 sec, PAUSE : Approx. 1.9 sec to approx. 32 sec
5-2-8 Focal length display			None. Includes simple zoom display in viewfinder.
5-2-9 Macro mechanism			Wide end macro
5-2-10 Macro shooting distance			10 mm (from lens front)
5-2-11 Filter diameter			27 mm P0.5
5-2-12 Accessory			The following can be used: WD-H27, TL-H27, FS-H27U
5-2-13 Lens hood			None
5-2-14 Lens cap			Built-in type

5-3 Digital zoom		
Still image		None
Movie	Magnification	DC10 E : - 40× / 200×
		DC20 E : - 40× / 200×
	35 mm equivalent (at 4:3)	
		DC10 E : Approx. 1868 mm/9340 mm
		DC20 E : Approx. 1624 mm/8120 mm
5-4 Image stabilization function		Included (Movie mode only)
5-4-1 System		Electronic system
5-4-2 Camera shake detection system		Angular velocity sensing (using piezoelectric vibration sensor)
5-5 Shooting modes		
5-5-1 Movie camera		Records movies in VIDEO mode or VR mode to 8 cm DVD-R/-RW discs (It is not possible to record using two standards at the same time on one disc). However, -R discs can record in VIDEO mode only, and still images (640 x 480) can be recorded while recording disc movies when a miniSD card is installed.
5-5-2 Still image camera		Disc Still Image mode and Card Still Image mode can be selected using the MENU button.
a. Disc mode		Still images (JPEG compression) are recorded to a 8 cm DVD-R/-RW disc.
		(See section 6, “DVD recorder unit”)
b. Card mode		Still images (JPEG compression) are recorded to an miniSD memory card. Movie recording is not available.
		(Refer to the “Memory Card System”)
5-6 Exposure control		
5-6-1 AE mode		AUTO, P (Program AE), Av (aperture priority AE), Tv (shutter priority AE), Portrait, Sports, Night, Snow, Beach, Sunset, Spotlight, Fireworks
5-6-2 Photometry system		
	Movie	Center weighted average photometry
		: AUTO, P, Av, Tv, Portrait, Sports, Night
		All area average photometry + 128-segment (16H × 8V) evaluative photometry
		: Spotlight, Snow, Beach, Sunset mode
		No photometry : SCN (Fireworks) ... (Fixed exposure : 1/50 sec)
	Still image	128-segment frame evaluative photometry
		: AUTO, Portrait, Sports, Night
		All area average photometry + 128-segment (16H × 8V) evaluative photometry
		: Spotlight, Snow, Beach, Sunset mode
		Selectable from 128-segment evaluative photometry, center-weighted average photometry, and spot photometry (center frame)
		: Av, Tv, and P (evaluative photometry is the default for these). Spot photometry is photometry for the center frame only.
		No photometry : SCN (Fireworks) ... (Fixed exposure : 2 sec)
5-6-3 Exposure correction function		
Exposure lock		Exposure is locked by pressing the cross key (up).After the exposure is locked, the cross key can be used to move the right or left and correct the exposure (except in AUTO mode).
Exposure correction amount		±11 levels (-11 to ±0 to +11, ±2.75 EV)
		Indicated by exposure correction bar and number in the viewfinder.

5-6-4 Electronic shutter		
5-6-4-1 In Auto mode		
	Movie	1/30 to 1/500 sec (with auto slow shutter OFF)
		1/25 to 1/500 sec (with auto slow shutter ON)
	Still image	1/25 to 1/500 sec (with auto slow shutter OFF)
		1/12.5 to 1/500 sec (with auto slow shutter ON)
	When the image stabilizer is ON	
		1/100
	When the image stabilizer is OFF	
		1/50
5-6-4-2 Slow Shutter mode		None
5-6-4-3 Av mode (Both Movie and Still image)		
	Aperture setting	F1.8, 2.0, 2.4, 2.8, 3.4, 4.0, 4.8, 5.6, 6.7, 8.0, 9.5, 11, 14, 16
5-6-4-4 Tv mode		
	Shutter setting	Movie : 1/6, 1/12.5*, 1/25, 1/50, 1/120, 1/250, 1/500, 1/1000, 1/2000 sec
		Still image : 1/2, 1/3, 1/6, 1/12.5*, 1/25, 1/50, 1/120, 1/250, 1/500 sec
		*Display shows “12”
5-6-4-5 Night mode		Both Tape and Card : 1/2 - 1/500 sec
5-6-4-6 Other modes		P, Portrait, Sports, Snow, Beach and Sunset modes are same as Auto Slow Shutter Off in AUTO mode.
	Spotlight	Movie : 1/50 sec only
		Still image : 1/25 sec to 1/100 sec
	Fireworks	Movie : 1/50 sec only
		Still image : 2 sec only
5-7 AF (Auto Focus)		
5-7-1 System		TTL-video signal sensing system AF
5-7-2 AF range finding area		
Movie		Screen center
Still image		Includes Ai (Artificial intelligence) AF function where the camera automatically selects from 9 range-finding frames on the screen and screen center function where range-finding is fixed at the center frame on the screen (not user selectable). Also, AiAF and fixed at center can be selected only when Focus Priority ON is selected. AF is fixed at the screen center during Stitch assist.
5-7-3 Range-finding frame display		
Movie		None
Still image		Included. The AF frame (including multiple locations/center AF frame for center fixed) that has come into focus is indicated by a green light. The AF frame appears with a yellow frame when the subject cannot be brought into focus or for slow shutter states with a shutter speed of 1/2 second or more to less than 1/6 second.
5-7-4 AF operating range		10 mm to infinity (Wide end), Full zoom area: 1 m to infinity (from lens front), Fireworks mode: Fixed at infinity.
5-7-5 AF operation illumination range		Approx. 50 lx - 100,000 lx
5-7-6 AF mode switching		Continuous AF/Manual focus. AF ON/OFF switching is possible in all except AUTO mode (manual focus operation is possible by right and left operation after pressing the cross key down button). During manual focus, the “MF” indicator appears in the viewfinder.
5-7-7 Forced infinity setting		Holding down the focus button (cross key down) for about three seconds sets to Infinity and displays “ ∞ ” in the viewfinder.
5-8 Viewfinder		0.33-inch color LCD (approx. 123,000 pixels) ON when LCD monitor closed (panel facing inwards) and during mirror shooting
5-8-1 Rotation		Not possible (fixed)
5-8-2 Detaching eyepiece		Not possible
5-8-3 Diopter movement range		+1.5 to -5.5 diopter (when eye is at eyepiece)
5-8-4 Lens configuration		Single-lens configuration

5-9 LCD panel	2.5-inch color LCD Approx. 123,000 pixels (560 [H] × 220 [V]) TFT active-matrix drive. RGB delta arrangement; ON when LCD monitor not closed (when panel faces inwards)
5-9-1 Angle adjustment	Possible. Monitoring is possible for high-angle, low-angle, and mirror shooting.
5-9-2 Information display	Color display of operating mode, simple zoom position, remaining battery charge, remaining disc space, time code, warnings and other indications. 10 languages supported : Japanese, Chinese (traditional), Chinese (simplified), English, German, French, Italian, Spanish, Russian, Korean. A limited number of indicators are displayed during mirror shooting.
5-9-3 LCD backlight adjustment (BACKLIGHT)	Adjustment is possible using button operation. The setting switches between “Bright” to “Dark” each time the button is pressed. The default setting during battery operation is “Dark”. The default setting during compact power adapter (CA) operation is “Bright”. If the power supply is switched from battery operation to CA operation while the power is on, the setting made during CA operation is used (CA operation default setting is used if no setting was made). In the same way, if the power supply is switched from CA operation to battery operation while the power is on, the setting made during battery operation is used (battery operation default setting is used if no setting was made).
5-9-4 Relationship between LCD monitor and viewfinder (CVF)	

LCD panel position	Camera mode/Card Camera mode		Movie playback mode/ Still image playback mode	
	LCD panel	CVF	LCD panel	CVF
Panel closed (panel facing inwards)	OFF	ON	OFF	ON
Panel closed (panel facing outwards)	ON	OFF	ON	OFF
Panel open	ON	OFF	ON	OFF
Mirror shooting *1	ON *2	ON	ON	OFF

*1 : In mirror mode, only the disc and self-timer indicators are displayed.
*2 : Mirror mode possible by menu selection.

5-10 White balance adjustment	TTL 128-segments, new white extraction system FAWB. Auto/Set/Preset. Presets are available : Daylight : 5400 K; Shade : 8000 - 8500 K; Cloudy : 6000 K; Tungsten (incandescent lamps and halogen bulbs) : 3000 K; Fluorescent H (3-wavelength type fluorescent) : 6500 K; Fluorescent (white fluorescent) : 4000 K. Presets are not possible in SNC and AUTO modes.
5-10-1 Adjustment range	2,800K to 8,000K
5-11 Digital feature functions	The following modes are provided : Fader, Effects, Multi-screen Fader : Linked to Start/Stop button. Can be used 1 time when Fade mode displayed. (Mode indication goes out when Fader ends.) Effects : Effect continues until mode is turned OFF. Multi-screen : Loads and displays multiple screens at set interval or manually. Displayed until mode is turned OFF.
5-11-1 Fader	Audio synchronized fader Auto Fade (Japanese model : Fade to white, Overseas model: Fade to black), Wipe, Corner Wipe, Jump, Flip, Puzzle, Zigzag, Beam, Tide
5-11-1-1 Fade time	Approx. 4 sec
5-11-2 Effects	Black & White, Sepia, Art, Mosaic, Ball, Cube, Wave, Color Mask, Mirror (only Black & White is available during Disc/Card Still Image Recording mode)
5-11-3 Multi-screen	Except in Night mode, Auto mode
5-11-3-1 Number of screens	4 (2 × 2), 9 (3 × 3), 16 (4 × 4)
5-11-3-2 Operation mode	Manual, Fast (4 frames), Normal (6 frames), Slow (8 frames)
5-11-4 Card Mix	
5-11-4-1 Mix type	Card Chroma key, Card Lumi. key, Camera Chroma key, Card Animation (Sample images are included in the supplied CD.)
5-11-4-2 Mix level adjustment	32 levels
5-11-4-3 Card animation	Corner Animation, Straight Animation, and Random Animation
5-11-5 Operation mode	See section 12, “Relationship between DC10 E, DC20 E functions and modes”.

5-12 Built-in microphone	Stereo (using electret condenser microphone) Omni-directional microphone × 2 + Electric circuitry for stereo
5-12-1 Wind screen function	Included. With ON/OFF switch (Menu selection. Available for built-in microphone only)
5-13 Built-in Flash Shooting (DC20 E only)	Pre-flash light adjustment system
5-13-1 Flash modes	Auto flash, auto flash with red-eye reduction, manual flash, flash off
5-13-2 Shutter speed	Flash On : Flash at 1/1000 sec or less in Movie mode and at 1/500 sec or less in Still Image mode.
5-13-3 Shooting distance	Wide end, approx. 80 cm to 2.5 m, Tele end, approx. 1 m to 1.3 m The allowable shooting range is indicated as approx. 1 to 2 m in the Instruction Manual.
5-14 Auxiliary light source (DC20 E only)	Includes mini video light (equipped with high-brightness white LED) with light button. Enables shooting at distances of approx. 1.5 m in AUTO mode.
5-14-1 Flash mode	The AF auxiliary light is set to Auto when AF Auxiliary Auto is selected and when red-eye reduction function is selected. The AF auxiliary light is OFF in Fireworks mode.
5-15 Other additional functions	
5-15-1 Disc counter	The total cumulative time for a recoding scene is indicated by hours: minutes: seconds.
5-15-2 Data code	The date and camera information during recording are automatically recorded and can be displayed during playback.
a. Time and date	Automatic calendar range: January 1, 2005 through December 31, 2030 (the initial setting is January 1, 2005) The recording start (year/month/day) display can be selected from the three options below: ☀ パリ AM 12:00 2005. 1. 1 ☀ PARIS 12:00 AM JAN. 1, 2005 ☀ PARIS 12:00 AM 1. JAN. 2005 Supports world clock (Selecting the city name of your destination automatically adjusts to the date and time of the destination. Supports daylight saving time), and records the recording start time (hour/minute/second).
b. Camera data	Shutter speed and aperture value information are recorded (but not displayed during recording), and can be displayed during playback. During playback, time can be displayed in five different modes (date only, time only, date and time, or date and time and camera data).
5-15-3 Accessory shoe	Not supported
5-15-4 REC Search function	None
5-15-5 REC Review function	Supported. Accessed by operating the Recording Check button when camera recording is paused. Plays back the movie from the beginning of the recorded scene and then returns to the state before playback started. There is no sound.
5-15-6 Remote control reception ON/OFF	Possible. This can be done in Camera mode and PLAY mode (by selecting from menu).
5-15-7 Headphone volume adjustment	Not available (Headphone terminal not included)
5-15-8 Widescreen TV (16:9)	When Widescreen TV mode is selected (button setting), the LCD panel screen changes to letterbox display (top and bottom of the screen are masked with black bands). Setting is possible in AUTO mode. Widescreen TV cannot be set under VIDEOmode and LP mode
5-15-9 AEB shooting	Recording is done in Card/Camera mode with exposure correction automatically changed to ±0 level, -0.5 level, and +0.5 level. (Continuous shooting mode: when AEB is selected) Flash shooting is not possible.
5-15-10 Still image check time setting	After releasing the Photo button, the display time can be set for checking the still images. One of 6 settings; OFF (0 sec), 2, 4, 6, 8, or 10 seconds can be selected as the setting mode.
5-15-11 Microphone attenuation	No function
5-15-12 Microphone level meter	No function
5-15-13 Image effect settings	The available image effect settings in the FUNC. menu are Vivid, Neutral, Low Sharpening, Soft Skin Detail, and Custom. These settings cannot be made in Special Scene mode.
Vivid	Emphasizes contrast and color depth, and presents images with vibrant and striking colors.
Neutral	Limits the contrast and color depth, and presents pure images without any enhancements.
Low Sharpening	Provides image with less distinct outlines and a softer touch.
Soft Skin Detail	Smoothes the outlines of skin sections, and presents skin sections with a softer tone.
Custom	Enables adjustment of the brightness, contrast, sharpness, and color depth.

6 DVD Recorder section

6-1 Recording functions — Camera shooting and recording only (analog line input recording is not possible), movie and audio is recorded to 8 cm DVD-R/-RW disc.

6-1-1 Movie — When set to Disc Movie mode, movies are recorded in a 8 cm DVD-R/-RW disc in VR mode or VIDEO mode. However, recording is only possible in VIDEO mode for 8 cm DVD-R discs (automatic setting). The image quality setting mode can be selected from XP, SP, or LP (FUNC. menu selection).

6-1-2 Still image — When set to Disc Still Image mode, still images are recorded to a 8 cm DVD-R/-RW disc (JPEG compression).
The available recording pixels are 1632 × 1224 (DC20 E only), 1280 × 960, 640 × 480, and the available image settings of Super Fine, Fine, and Normal. Still images cannot be recorded during movie playback.

a. File name and folder name — Based on the DCF (Design rule for Camera File system) and still image (Exif Ver 2.2) file management specifications/DPOF (Digital Print Order Format) file management specifications, the following names are assigned to recorded discs after initializing in the Initialization menu.

Types of files	Type	Folder name and file name
Still image (Exif 2.2) file	JPEG	//DCIM/xxxCANON/PIC_yyyy.JPG
ZoomBrowser	JPEG	//DCIM/xxxCANON/AUT_yyyy.JPG

xxx : Folder No., yyy : File No., z : A to Z
DCF folder and file name//DCIM/xxxCANON/AUT_yyyy.JPG xxx: Folder No.,
yyyy : File No., Internal management is performed based on folder number-file number.
Photographed images are assigned file numbers from 0001 to 9900, and are stored in folders (100 files to a folder). Each folder is assigned numbers 100 to 998.

6-1-3 Estimated number of recordable still images on disc (single-sided type)

Image size	Image quality mode	Number of recorded images (VIDEO mode)	Number of recorded images (VR mode)
1632 × 1224 (DC20 E only)	S.Fine	Approx. 1025	Approx. 1025
	Fine	Approx. 1585	Approx. 1590
	Normal	Approx. 2910	Approx. 2915
1280 × 960	S.Fine	Approx. 1630	Approx. 1635
	Fine	Approx. 2495	Approx. 2500
	Normal	Approx. 4595	Approx. 4600
640 × 480	S.Fine	Approx. 7945	Approx. 7960
	Fine	9999	Approx.11680 (9999) *1
	Normal	9999	Approx.19470 (9999) *1

* The number of recordable images depends on the usage (subject and shooting) conditions. The number of images that can be recorded on a double-sided disc is twice that of a single-sided disc.
*1 : The maximum display is 9999.

6-2 Playback functions

6-2-1 Playback disc — 8 cm DVD-R (DVD-VIDEO), 8 cm DVD-RW (DVD-VIDEO , DVD-VR)

6-2-2 Playback type

a. Standard Playback — Video and audio (Dolby Digital 2ch) recorded in XP, SP, and LP modes

b. Forward search — 4 levels : 1.5× speed (with audio), 5× speed, 15× speed, and 25× speed

c. Reverse search — 4 levels : 2.5× speed, 5× speed, 15× speed, and 25× speed

d. Slow playback in both directions — ±1/2×, ±1/4×, ±1/8×, ±1/16× speed, slow playback not possible in the DVD-VIDEO mode.

e. Scene search — Function plays the beginning of the current scene or the beginning of the next scene
* The disc counter during playback displays the playback time from the beginning of the recorded scene only.

6-3 Editing functions	This function edits movies or dics
6-3-1 Original movie editing	This function edits original movies (scenes) recorded in VR mode. Deleting, dividing and adding to playlist is possible. When images are recorded in the DVD-VIDEO mode (-RW disc) only the scene which has just been shot can be deleted. The dividing of one phot-movie is not possible.
6-3-2 Playlist editing	This function enables editing of lists of the scene playback order in VR mode. Delete, Divide, Move, Erase Entire Playlist are available. With thumbnail display (6 thumbnails in 2 rows and 3 columns).
6-3-3 Disc title	This function enters an original name for the disc. Alphanumeric characters and symbols can be entered. The maximum number of input characters is 20 single-byte characters. The name can be confirmed on standalone players (depending on the player). The disk title input is possible in all disks and the recording modes in cases where they are not finalized.
6-3-4 Disc protect	This function protects the disc by disabling recording and editing. However, discs can still be initialized.
6-3-5 Create photo movie	This function converts Disc Still Images (JPEG compression) to MPEG movies. Playlist editing and playback in a DVD player is possible for the still images. With single-operation photo movie creation function.The photo movie function is possible in all discs and the recording modes in cases where they are not finalized.
6-4 Finalize	This process enables playback in other players and recorders that support DVD-VIDEO and DVD-VR. In this finalization process, the shorter the recording time, the more dummy data is needed fill the remaining space, and this tends to result in a longer finalization time. Execute/ Cancel. When this finalization is performed, be aware that certain disc types and recording systems have limitations on additional recording, editing, and initializations. Includes display of finalization time and remaining finalization time. Finalization is not possible when using a battery pack. Finalization is possible when the Compact Power Adapter is connected. Be especially careful during finalization since the data can be corrupted if the Compact Power Adapter is disconnected during finalization.

	Additional recording	Editing	Initialization
DVD-R (VIDEO mode only)	Not possible	Not possible	Not possible
DVD-RW (VIDEO mode)	Not possible (*)	Not possible (*)	Enabled
DVD-RW (VR mode)	Enabled	Enabled	Enabled

* When the VIDEO mode (DVD-RW) is recorded, additional recording and editing become possible by releasing finalizing. The only editing operations are the input of disc title and deleting of a scene.(Deleting a scene is possible only for the image that has just been shot: it is not possible on a disc which has been removed from the body or played back.

6-5 Input signals	
6-5-1 USB port only	mini-B
USB device class	Supports USB 2.0 Hi-Speed class

6-6 Output signals	
6-6-1 DV terminal	None
6-6-2 Multi-pin	Flat type Multi 10-pole
a. Video signals	
Signal configuration	PAL standard color video signals
Output Impedance	75 Ω
Output Signal level	1 Vp-p (composite)
Horizontal resolution	Approx. 530 TV lines (screen center)
Self recording/playback	Max. 530 TV lines (screen center)
Camera EE OUT	Catalog value: Approx. 530 TV lines (screen center)
b. Audio signal	
Types of signals	Stereo audio signal
Output Impedance	Max. 75 KΩ
Output Signal level	–10 dBv (with 47 KΩ load)
Frequency characteristics	60 Hz to 16 KHz (Range between 1 KHz reference ± 3 dB)
Audio signal S/N	Min. 48 dB
c. S-Video signal	
Signal configuration	PAL Y/C separated video signal
Video signals	1 Vp-p (luminance + sync signals)
Impedance	75 KΩ
Signal level	0.3 Vp-p (Color burst signal)
Horizontal resolution	Approx. 530 TV lines (screen center)
Self recording/playback	Max. 530 TV lines (screen center)
Camera EE OUT	Catalog value: Approx. 530 TV lines (screen center)
6-6-3 Headphone terminal	None
6-6-4 USB terminal	
USB device class	Supports USB 2.0 Hi-Speed class PTP class, mass storage class
Compatible computer systems	Windows : IBM PC/AT compatible, NEC PC98-NX Series Macintosh : Power Macintosh, PowerBook, iMac, iBook
PC operating system	Windows : Windows 98 SE, Windows ME, Windows 2000, Windows XP Macintosh : Mac OS X 10.1.5 or later “MyDVD for Canon” Software operates only on Windows ME, Windows 2000 (SP4), and Windows XP.
6-7 Memory card system	
6-7-1 Types of cards used	miniSD memory card
6-7-2 Recordable image types	
a. Still image	JPEG compression recording
Disc Camera mode	When [FINE] or [NORMAL] is selected in the FUNC. menu, still images (640 × 480) can be recorded to the memory card by pressing the photo button while movie is being recorded to disc.
Card Camera mode	Still image is recorded using the Photo button (image size and image quality are selectable). Writing in Progress warning is displayed in the EVF/LCD.
During video playback	Not possible
b. Movie	Not possible

6-7-3 File names/folder names

Based on the DCF (Design rule for Camera File systems) and still image (Exif 2.2) file management specifications / DPOF (Digital Print Order Format) file management specifications, the following names are assigned to recorded cards after initializing in the Initialization menu.

a. Card volume label CANON DV

Types of files	Type	Folder name and file name
Still image (Exif 2.2) file	JPEG	//DCIM/xxxCANON/IMG_yyyy.JPG
PhotoStitch	JPEG	//DCIM/xxxCANON/STz_yyyy.JPG
ZoomBrowser	JPEG	//DCIM/xxxCANON/AUT_yyyy.JPG
DPOF file	TEXT	//MISC/AUTPRINT.MRK
DPOF automatic transmission file	TEXT	//MISC/AUTXFER.MRK

b. File number xxx : Folder No., yyy: File No., z: A to Z

DCF folder and file name//DCIM/xxxCANON/AUT_yyyy.JPG xxx : Folder No., yyyy : File No., Internally managed by folder number-file number.

Photographed images are assigned file numbers from 0001 to 9900, and are stored in folders (100 files to a folder). Each folder is assigned numbers 100 to 998.

Relationship between folder No. and file No.

Folder No.	File No.	Saved files
101	0101 0102 0103 ···· 0199 0200	Recording area of photographed image
102	0201 0202 0203 ···· 0299 0300	
···		
198	9801 9802 9803 ···· 9899 9900	
200	0001 0002 0003 ···· 0099 0100	
···		
998	9801 9802 9803 ···· 9899 9900	

Photographed images start from 101-0101, and are numbered to be greater than Directory No. - File No. of files saved on Memory Cards.

6-7-4 Recorded image size/image quality

a. Still image recording

During simultaneous movie recording

640 × 480 (VGA) / Switchable between Fine and Normal

During still image recording 1632 × 1224 (DC20 E only), 1280 × 960, 640 × 480 / Switchable between Super Fine, Fine, and Normal

During movie playback Not possible

b. Movie recording Not possible

6-7-5 Number of recorded images (miniSD card)

Image size (Still image)	Image quality	Number of recorded images					Data size /1 card
		16MB Card	32MB Card	64MB Card	128MB Card	256MB Card	
1632 × 1224 (DC20 E only)	S.Fine	9	20	40	85	175	1360KB
	Fine	14	30	65	135	275	880KB
	Normal	25	55	120	250	500	480KB
1280 × 960	S.Fine	15	30	65	140	280	850KB
	Fine	20	50	105	215	430	560KB
	Normal	40	90	195	395	795	300KB
640 × 480	S.Fine	75	165	340	690	1380	176KB
	Fine	105	285	470	955	1900	120KB
	Normal	170	365	750	1525	3040	72KB

* The given number of recorded images is for reference only. The number varies greatly depending on the subject and other conditions when taking pictures.

6-7-6 Card initialization

Initialization using the Initialization command in the menu of the main unit. Operation is not guaranteed with PC initializations as problems can occur with some OS.

6-7-7 Usable memory card

miniSD memory card	SanDisk	: 16MB, 32 MB, 64 MB, 128 MB, 256 MB
	Matsushita Electric	: 16MB, 32 MB, 64 MB, 128 MB, 256 MB
	Toshiba	: 16MB, 32 MB, 64 MB, 128 MB, 256 MB

6-7-8 Number of continuous shots and number of stored continuous shots (card still image only)

DC20 E

Image size	Number of continuous shots recorded per second			Maximum continuousness number of recordable images
	Normal continuous shooting	High-speed continuous shooting	Flash recording	
1632 × 1224	Approx. 2.1 images	Approx. 2.5 images	Approx. 1.8 images	10 images
1280 × 960	Approx. 2.5 images	Approx. 4.2 images	Approx. 2.1 images	10 images
640 × 480	Approx. 2.5 images	Approx. 4.2 images	Approx. 2.1 images	60 images

* The flash output is approx. 1/4 of the output when taking single shots. The number of recordable images when using the flash is identical to the Maximum continuousness number of recordable images in the table above.

DC10 E

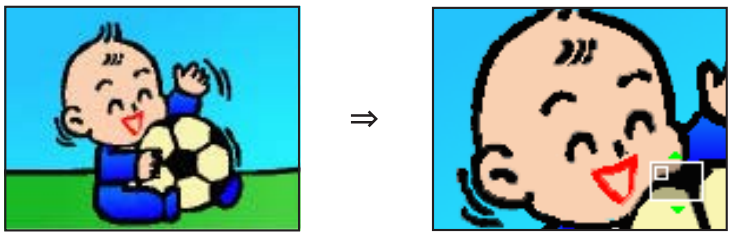
Image size	Number of continuous shots recorded per second		Maximum continuousness number of recordable images
	Normal continuous shooting	High-speed continuous shooting	
1280 × 960	Approx. 3.0 images	Approx. 5.0 images	10 images
640 × 480	Approx. 3.0 images	Approx. 5.0 images	60 images

6-8 Digital feature display	None
6-9 Direct print	Still images recorded on memory cards or discs can be easily printed through controls on the video camera by connecting to a CP-200/300 compact printer or PictBridge-compatible ( ) printer (sold separately), using the supplied IFC-300PCU interface cable.
6-9-1 Printable images	Only the still images (JPEG compression) which have been recorded on the miniSD memory cards or discs.
6-9-2 Print format	Single image/eight-image print (only when the card size paper tray has been installed in CP200/300/220/330/400/500/600). Printing is not available from the index screen.
6-9-3 Trimming	Possible
6-9-4 Date printing	Possible (when connected to CP-220/330/400/500/600 or PictBridge-compatible printer)
6-9-5 Number of print copies	Easy Print : 1 to 99 sheets DPOF printing (miniSD memory card only) : Max. 998 images, 1 to 99 each

6-9-6 Print systems

Print manufacturer		Canon				Other manufacturer
Printer specifications		CP specifications	CP specifications +PictBridge specifications	BJ Photo specifications only	CP specifications +PictBridge specifications	PictBridge specifications only
Suitable printer		CP-10/100	CP-200/300^{2nd}/220/ 330/400/500/600	BJ-895PD/535PD/F890PD, PIXUS 50i/80i/450i/470PD	PIXUS 990i/900PD/ DS700	
Printer specifications when connected to DC10 E/ DC20 E		Not supported	PictBridge specifications	Not supported	PictBridge specifications	PictBridge specifications
When the printer is connected			PictBridge control		PictBridge control	PictBridge control
Printing functions	Paper setting		×		×	×
	Paper size		○		○	(○)
	Paper type		○		○	(○)
	Borders/ no borders		○		○	(○)
	8-of-1 screen layout		○ (When using card paper)		×	(○)
	Sectional printing		×		×	(○)
	Image optimizing		(○)		○	(○)
	Date printing		(○)		○	(○)
	Trimming		○		○	(○)

(◯) : When the printer is supported
The model names of supported printers are all Japanese model names.

6-10 Other functions	
6-10-1 Automatic stop function	When forward still image playback is continued for approx. 5 minutes, or reverse still image playback is continued for approx. 5 minutes. When the disc end or beginning is reached.
6-10-2 Power automatic stop function	When Recording Pause continues for approx. 5 minutes. When the battery voltage falls below a specified value.
6-10-3 Copy between media	This function copies disc still images (JPEG compression) to a card or card still images (JPEG compression) to a disc. With still image all copy function.
6-10-4 World clock display	Set reference city (city of time clock setting) and select name of city when shooting. Date and time are automatically adjusted to local date and time, and recorded in data code.
6-10-5 Speaker	Built-in, volume adjustment provided
6-10-6 Battery charging function	When the Canon Compact Power Adapter CA-570 is connected, the battery pack installed in the battery pack compartment can be charged. (During charging, the charge lamp flashes [Charging level : One flash per second for a charge level of 0% to approximately 50%, two flashes per second for a charge level of 50% to 95%, and the lamp lights for a charge level of 95% or more]).
Charging time	BP-208: Approx. 165 minutes
6-10-7 File transfer	
USB file transfer	Still images recorded on memory cards and discs can be uploaded to a PC in the camcorder by connecting the included IFC-300PCU interface cable between a USB port on the PC and the USB port of the camcorder. Still images from a PC can be downloaded to memory cards in the camcorder. However, writing to the disc is not possible.
6-10-8 Analog / Digital conversion	Not possible
6-10-9 Playback zoom	If the zoom lever is flipped to the Tele side during still image playback from the card or disc, the image being played back can be enlarged up to 5 times its size (The initial setting of the playback zoom switch is 2× playback zoom, and this can be changed to 1× to 5× using the zoom lever). Playback zoom is cancelled by holding the zoom lever to the Wide side until the frame display no longer appears. Zoom not possible during movie playback. Position of the enlarged section during enlarged screen view can be changed by the cross key (On the LCD monitor, a frame is displayed to show the zoom-in area, and this frame can be moved using the four direction operations of the cross key). 
6-10-10 PRINT/SHARE button	Supported. This button lights up when the camcorder is connected to a PictBridge-compatible printer or PC (ZoomBrowser 4.6x or higher must be installed). The button can then be pressed to send print images on the printer or send images to the PC. When the supplied “MyDVD for Canon” software is installed (Windows XP only) and a 12 cm DVD (-R/-RW) black disc is loaded in the PC, this button turns on. Pressing the button enables burning of the 12 cm DVD in the PC (one-operation burning function). Discs in the DC10 E, DC20 E need to be finalized. The 12 cm DVDs on the PC side are also finalized.
6-10-11 Built-in lithium battery	Built-in. When the battery is not used for about three months, the power may be discharged and the date and time settings will be lost. The date and time need to be reset after either connecting a power supply or installing batteries and charging. It takes approximately 24 hours for a full charge.
7 Terminals	
7-1 DV terminal	None
7-2 Multi-pin	Multi 10-pin (AV, S), output only
7-3 External microphone input terminal	None
7-4 Headphone terminal	None
7-5 USB terminal	mini-B Receptacle, (USB 2.0 Hi-Speed class compliant)
7-6 Memory card terminal	Special multi-pin
7-7 Battery terminal	Special 3-pin
7-8 DC input terminal	ϕ 3.4 mm jack

8 Power supply			
	8-1 Input power supply		7.4 V DC (battery pack), 8.4 V DC (DC IN)
	8-2 Power consumption		
		DC10 E Shooting	XP : Approx. 5.1 W, SP : Approx. 4.6 W, LP : Approx. 4.2 W (CVF)
			XP : Approx. 5.2 W, SP : Approx. 4.7 W, LP : Approx. 4.3 W (LCD Normal)
			XP : Approx. 5.3 W, SP : Approx. 4.8 W, LP : Approx. 4.4 W (LCD Bright)
		Playing	XP : Approx. 4.6 W, SP : Approx. 4.2 W, LP : Approx. 3.8 W (LCD Normal)
		DC20 E Shooting	XP : Approx. 5.8 W, SP : Approx. 5.3 W, LP : Approx. 4.8 W (CVF)
			XP : Approx. 5.9 W, SP : Approx. 5.4 W, LP : Approx. 4.9 W (LCD Normal)
			XP : Approx. 6.0 W, SP : Approx. 5.5 W, LP : Approx. 5.1 W (LCD Bright)
		Playing	XP : Approx. 4.9 W, SP : Approx. 4.4 W, LP : Approx. 4.1 W (LCD Normal)
			* The power consumption during recording shows the data during recording and AF focusing.
9 Dimensions (W × H × D)			Approx. 48 × 86 × 122 mm (1.9 × 3.4 × 4.8 in.) (Not including maximum protrusions)
10 Weight			
	10-1 Main unit		Approx. 415 g (14.6 lb)
	10-2 Total equipped weight		Approx. 465 g (1.0 lb) (Including BP-208, DVD disc, and memory card)
11 Temperature and humidity requirements			
	11-1 Temperature and humidity requirements for performance		0 to 40°C, 85% (relative humidity)
	11-2 Temperature and humidity requirements for operation		–5 to 45°C, 65% (relative humidity)

12 Relationship between DC10 E, DC20 E functions and modes

*:Initial setting

Backup is performed (not cancelled when power is shut off).

Except when card simultaneous recording is OFF. Cannot be set when card simultaneous recording is OFF. And backup is performed.

Effect function is black and white.

Settings can be changed, but operation is single shot.

–: Cannot be set

Settings can be changed, but operations are disabled. Backup is performed.

Enabled when card simultaneous recording is ON. Settings can be made when card simultaneous recording is OFF, but operation is disabled. Backup is performed.

Conditional backup is performed.

Settings can be made when AF and Focus Priority is ON. Backup is performed.

		Disc Still Image											
			SCN								P		
		AUTO	Portrait	Sports	Night	Snow	Beach	Sunset	Spotlight	Fireworks	P	Tv	Av
Recording pixels	Large	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Medium	○	○	○	○	○	○	○	○	○	○	○	○
	Small	○	○	○	○	○	○	○	○	○	○	○	○
Compression ratio	Super Fine	○	○	○	○	○	○	○	○	○	○	○	○
	Fine	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Normal	○	○	○	○	○	○	○	○	○	○	○	○
Simultaneous recording 640 x 480	OFF	–	–	–	–	–	–	–	–	–	–	–	–
	Fine	–	–	–	–	–	–	–	–	–	–	–	–
	Normal	–	–	–	–	–	–	–	–	–	–	–	–
Flash (DC20 E only)	Auto	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Always On	○	○	○	○	○	○	○	○	○	○	○	○
	OFF	○	○	○	○	○	○	○	○	○	○	○	○
	Red-eye Reduction	○	○	○	○	○	○	○	○	○	○	○	○
Drive mode	Single shooting	○	○	○	○	○	○	○	○	○	○	○	○
	Continuous shooting	–	–	–	–	–	–	–	–	–	–	–	–
	High-speed continuous shooting	–	–	–	–	–	–	–	–	–	–	–	–
	AEB	–	–	–	–	–	–	–	–	–	–	–	–
Night	Night	–	–	–	○*	–	–	–	–	–	–	–	–
Mini video light (DC20 E only)	OFF	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	ON	○	○	○	○	○	○	○	○	○	○	○	○
Digital Zoom	ON	–	–	–	–	–	–	–	–	–	–	–	–
	OFF	–	–	–	–	–	–	–	–	–	–	–	–
White balance	AUTO	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Sun	–	–	–	–	–	–	–	–	–	○	○	○
	Shade	–	–	–	–	–	–	–	–	–	○	○	○
	Cloudy	–	–	–	–	–	–	–	–	–	○	○	○
	Tungsten	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent H	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent	–	–	–	–	–	–	–	–	–	○	○	○
	MANUAL	–	–	–	–	–	–	–	–	–	○	○	○
Color effects	OFF	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Vivid	–	–	–	–	–	–	–	–	–	○	○	○
	Neutral	–	–	–	–	–	–	–	–	–	○	○	○
	Low Sharpening	–	–	–	–	–	–	–	–	–	○	○	○
	Soft Skin Detail	–	–	–	–	–	–	–	–	–	○	○	○
	Custom	–	–	–	–	–	–	–	–	–	○	○	○
Metering system	Evaluative metering	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Center weighted average metering	–	–	–	–	–	–	–	–	–	○	○	○
	Spot metering (Center or AF frame continuous)	–	–	–	–	–	–	–	–	–	○	○	○
AF	AF	–	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	MF	–	○	○	○	○	○	○	○	○	○	○	○
	MF infinity	–	○	○	○	○	○	○	○	○	○	○	○
	AiAF	–	○*	○*	○*	○*	○*	○*	○*	–	○*	○*	○*
	Center fixed	–	○	○	○	○	○	○	○	–	○	○	○
	AF auxiliary light AUTO (DC20 E only)	○*	○*	○*	○*	○*	○*	○*	○*	–	○*	○*	○*
	AF auxiliary light OFF (DC20 E only)	○	○	○	○	○	○	○	○	–	○	○	○
	Focus Priority ON	–	○*	○*	○*	○*	○*	○*	○*	–	○*	○*	○*
	Focus Priority OFF	–	○	○	○	○	○	○	○	–	○	○	○
Digital Effects	Fader	–	–	–	–	–	–	–	–	–	–	–	–
	Effects	–	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white
	Multi-screen	–	–	–	–	–	–	–	–	–	–	–	–
	Card MIX	–	–	–	–	–	–	–	–	–	–	–	–
Photo stitch	OFF	–	–	–	–	–	–	–	–	–	–	–	–
	ON	–	–	–	–	–	–	–	–	–	–	–	–
EXP lock		–	○	○	○	○	○	○	○	–	○	○	○

		Card Still Image											
			SCN								P		
		AUTO	Portrait	Sports	Night	Snow	Beach	Sunset	Spotlight	Fireworks	P	Tv	Av
Recording pixels	Large	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Medium	○	○	○	○	○	○	○	○	○	○	○	○
	Small	○	○	○	○	○	○	○	○	○	○	○	○
Compression ratio	Super Fine	○	○	○	○	○	○	○	○	○	○	○	○
	Fine	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Normal	○	○	○	○	○	○	○	○	○	○	○	○
Simultaneous recording 640 x 480	OFF	–	–	–	–	–	–	–	–	–	–	–	–
	Fine	–	–	–	–	–	–	–	–	–	–	–	–
	Normal	–	–	–	–	–	–	–	–	–	–	–	–
Flash (DC20 E only)	Auto	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Always On	○	○	○	○	○	○	○	○	○	○	○	○
	OFF	○	○	○	○	○	○	○	○	○	○	○	○
	Red-eye Reduction	○	○	○	○	○	○	○	○	○	○	○	○
Drive mode	Single shooting	○	○	○	○	○	○	○	○	○	○	○	○
	Continuous shooting	–	○	○	○	○	○	○	○	○	○	○	○
	High-speed continuous shooting	–	○	○	○	○	○	○	○	○	○	○	○
	AEB	–	○	○	○	○	○	○	○	○	○	○	○
Night	Night	–	–	–	○*	–	–	–	–	–	–	–	–
Mini video light (DC20 E only)	OFF	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	ON	○	○	○	○	○	○	○	○	○	○	○	○
Digital Zoom	ON	–	–	–	–	–	–	–	–	–	–	–	–
	OFF	–	–	–	–	–	–	–	–	–	–	–	–
White balance	AUTO	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Sun	–	–	–	–	–	–	–	–	–	○	○	○
	Shade	–	–	–	–	–	–	–	–	–	○	○	○
	Cloudy	–	–	–	–	–	–	–	–	–	○	○	○
	Tungsten	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent H	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent	–	–	–	–	–	–	–	–	–	○	○	○
	MANUAL	–	–	–	–	–	–	–	–	–	○	○	○
Color effects	OFF	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Vivid	–	–	–	–	–	–	–	–	–	○	○	○
	Neutral	–	–	–	–	–	–	–	–	–	○	○	○
	Low Sharpening	–	–	–	–	–	–	–	–	–	○	○	○
	Soft Skin Detail	–	–	–	–	–	–	–	–	–	○	○	○
	Custom	–	–	–	–	–	–	–	–	–	○	○	○
Metering system	Evaluative metering	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Center weighted average metering	–	–	–	–	–	–	–	–	–	○	○	○
	Spot metering (Center or AF frame continuous)	–	–	–	–	–	–	–	–	–	○	○	○
AF	AF	–	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	MF	–	○	○	○	○	○	○	○	○	○	○	○
	MF infinity	–	○	○	○	○	○	○	○	○	○	○	○
	AiAF	–	○*	○*	○*	○*	○*	○*	○*	–	○*	○*	○*
	Center fixed	–	○	○	○	○	○	○	○	–	○	○	○
	AF auxiliary light AUTO (DC20 E only)	○*	○*	○*	○*	○*	○*	○*	○*	–	○*	○*	○*
	AF auxiliary light OFF (DC20 E only)	○	○	○	○	○	○	○	○	–	○	○	○
	Focus Priority ON	–	○*	○*	○*	○*	○*	○*	○*	–	○*	○*	○*
	Focus Priority OFF	–	○	○	○	○	○	○	○	–	○	○	○
Digital Effects	Fader	–	–	–	–	–	–	–	–	–	–	–	–
	Effects	–	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white	Black and white
	Multi-screen	–	–	–	–	–	–	–	–	–	–	–	–
	Card MIX	–	–	–	–	–	–	–	–	–	–	–	–
Photo stitch	OFF	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	ON	○	○	○	○	○	○	○	○	○	○	○	○
EXP lock		–	○	○	○	○	○	○	○	–	○	○	○

		Disc Movie 4:3											
			SCN								P		
		AUTO	Portrait	Sports	Night	Snow	Beach	Sunset	Spotlight	Fireworks	P	Tv	Av
Recording pixels	Large	–	–	–	–	–	–	–	–	–	–	–	–
	Medium	–	–	–	–	–	–	–	–	–	–	–	–
	Small	–	–	–	–	–	–	–	–	–	–	–	–
Compression ratio	Super Fine	–	–	–	–	–	–	–	–	–	–	–	–
	Fine	–	–	–	–	–	–	–	–	–	–	–	–
	Normal	–	–	–	–	–	–	–	–	–	–	–	–
Simultaneous recording 640 x 480	OFF	○	○	○	○	○	○	○	○	○	○	○	○
	Fine	○	○	○	○	○	○	○	○	○	○	○	○
	Normal	○	○	○	○	○	○	○	○	○	○	○	○
Flash (DC20 E only)	Auto	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Always On	○	○	○	○	○	○	○	○	○	○	○	○
	OFF	○	○	○	○	○	○	○	○	○	○	○	○
	Red-eye Reduction	○	○	○	○	○	○	○	○	○	○	○	○
Drive mode	Single image	–	–	–	–	–	–	–	–	–	–	–	–
	Continuous shooting	–	–	–	–	–	–	–	–	–	–	–	–
	High-speed continuous shooting	–	–	–	–	–	–	–	–	–	–	–	–
	AEB	–	–	–	–	–	–	–	–	–	–	–	–
Night	Night	–	–	–	○*	–	–	–	–	–	–	–	–
Mini video light (DC20 E only)	OFF	○	○	○	○	○	○	○	○	○	○	○	○
	ON	○	○	○	○	○	○	○	○	○	○	○	○
Digital Zoom	ON	○	○	○	–	○	○	○	○	○	○	○	○
	OFF	○*	○*	○*	–	○*	○*	○*	○*	○*	○*	○*	○*
White balance	AUTO	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Sun	–	–	–	–	–	–	–	–	–	○	○	○
	Shade	–	–	–	–	–	–	–	–	–	○	○	○
	Cloudy	–	–	–	–	–	–	–	–	–	○	○	○
	Tungsten	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent H	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent	–	–	–	–	–	–	–	–	–	○	○	○
	MANUAL	–	–	–	–	–	–	–	–	–	○	○	○
Color effects	OFF	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Vivid	–	–	–	–	–	–	–	–	–	○	○	○
	Neutral	–	–	–	–	–	–	–	–	–	○	○	○
	Low Sharpening	–	–	–	–	–	–	–	–	–	○	○	○
	Soft Skin Detail	–	–	–	–	–	–	–	–	–	○	○	○
	Custom	–	–	–	–	–	–	–	–	–	○	○	○
Metering system	Evaluative metering	–	–	–	–	–	–	–	–	–	–	–	–
	Center weighted average metering	–	–	–	–	–	–	–	–	–	–	–	–
	Spot metering (Center or AF frame continuous)	–	–	–	–	–	–	–	–	–	–	–	–
AF	AF	–	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	MF	–	○	○	○	○	○	○	○	○	○	○	○
	MF infinity	–	○	○	○	○	○	○	○	○	○	○	○
	AiAF	–	–	–	–	–	–	–	–	–	–	–	–
	Center fixed	–	–	–	–	–	–	–	–	–	–	–	–
	AF auxiliary light AUTO (DC20 E only)	○*	○*	○*	○*	○*	○*	○*	○*	–	○*	○*	○*
	AF auxiliary light OFF (DC20 E only)	○	○	○	○	○	○	○	○	–	○	○	○
	Focus Priority ON	–	–	–	–	–	–	–	–	–	–	–	–
	Focus Priority OFF	–	–	–	–	–	–	–	–	–	–	–	–
Digital Effects	Fader	–	○	○	○	○	○	○	○	○	○	○	○
	Effects	–	○	○	○	○	○	○	○	○	○	○	○
	Multi-screen	–	○	○	–	○	○	○	○	○	○	○	○
	Card MIX	–	○	○	○	○	○	○	○	○	○	○	○
Photo stitch	OFF	–	–	–	–	–	–	–	–	–	–	–	–
	ON	–	–	–	–	–	–	–	–	–	–	–	–
EXP lock		–	○	○	○	○	○	○	○	–	○	○	○

		Disc Movie 16:9											
			SCN								P		
		AUTO	Portrait	Sports	Night	Snow	Beach	Sunset	Spotlight	Fireworks	P	Tv	Av
Recording pixels	Large	–	–	–	–	–	–	–	–	–	–	–	–
	Medium	–	–	–	–	–	–	–	–	–	–	–	–
	Small	–	–	–	–	–	–	–	–	–	–	–	–
Compression ratio	Super Fine	–	–	–	–	–	–	–	–	–	–	–	–
	Fine	–	–	–	–	–	–	–	–	–	–	–	–
	Normal	–	–	–	–	–	–	–	–	–	–	–	–
Simultaneous recording 640 × 480	OFF	–	–	–	–	–	–	–	–	–	–	–	–
	Fine	–	–	–	–	–	–	–	–	–	–	–	–
	Normal	–	–	–	–	–	–	–	–	–	–	–	–
Flash (DC20 E only)	Auto	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	Always On	○	○	○	○	○	○	○	○	○	○	○	○
	OFF	○	○	○	○	○	○	○	○	○	○	○	○
	Red-eye Reduction	○	○	○	○	○	○	○	○	○	○	○	○
Drive mode	Single image	–	–	–	–	–	–	–	–	–	–	–	–
	Continuous shooting	–	–	–	–	–	–	–	–	–	–	–	–
	High-speed continuous shooting	–	–	–	–	–	–	–	–	–	–	–	–
	AEB	–	–	–	–	–	–	–	–	–	–	–	–
Night	Night	–	–	–	○*	–	–	–	–	–	–	–	–
Mini video light (DC20 E only)	OFF	○	○	○	○	○	○	○	○	○	○	○	○
	ON	○	○	○	○	○	○	○	○	○	○	○	○
Digital Zoom	ON	○	○	○	–	○	○	○	○	○	○	○	○
	OFF	○*	○*	○*	–	○*	○*	○*	○*	○*	○*	○*	○*
White balance	AUTO	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Sun	–	–	–	–	–	–	–	–	–	○	○	○
	Shade	–	–	–	–	–	–	–	–	–	○	○	○
	Cloudy	–	–	–	–	–	–	–	–	–	○	○	○
	Tungsten	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent H	–	–	–	–	–	–	–	–	–	○	○	○
	Fluorescent	–	–	–	–	–	–	–	–	–	○	○	○
	MANUAL	–	–	–	–	–	–	–	–	–	○	○	○
Color effects	OFF	–	–	–	–	–	–	–	–	–	○*	○*	○*
	Vivid	–	–	–	–	–	–	–	–	–	○	○	○
	Neutral	–	–	–	–	–	–	–	–	–	○	○	○
	Low Sharpening	–	–	–	–	–	–	–	–	–	○	○	○
	Soft Skin Detail	–	–	–	–	–	–	–	–	–	○	○	○
	Custom	–	–	–	–	–	–	–	–	–	○	○	○
Metering system	Evaluative metering	–	–	–	–	–	–	–	–	–	–	–	–
	Center weighted average metering	–	–	–	–	–	–	–	–	–	–	–	–
	Spot metering (Center or AF frame continuous)	–	–	–	–	–	–	–	–	–	–	–	–
AF	AF	–	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*	○*
	MF	–	○	○	○	○	○	○	○	○	○	○	○
	MF infinity	–	○	○	○	○	○	○	○	○	○	○	○
	AiAF	–	–	–	–	–	–	–	–	–	–	–	–
	Center fixed	–	–	–	–	–	–	–	–	–	–	–	–
	AF auxiliary light AUTO (DC20 E only)	–	–	–	–	–	–	–	–	–	–	–	–
	AF auxiliary light OFF (DC20 E only)	–	–	–	–	–	–	–	–	–	–	–	–
	Focus Priority ON	–	–	–	–	–	–	–	–	–	–	–	–
	Focus Priority OFF	–	–	–	–	–	–	–	–	–	–	–	–
Digital effects	Fader	–	○	○	○	○	○	○	○	○	○	○	○
	Effects	–	○	○	○	○	○	○	○	○	○	○	○
	Multi-screen	–	○	○	–	○	○	○	○	○	○	○	○
	Card MIX	–	○	○	○	○	○	○	○	○	○	○	○
Photo stitch	OFF	–	–	–	–	–	–	–	–	–	–	–	–
	ON	–	–	–	–	–	–	–	–	–	–	–	–
EXP lock		–	○	○	○	○	○	○	○	–	○	○	○

4. System Diagram (Common to all Models)

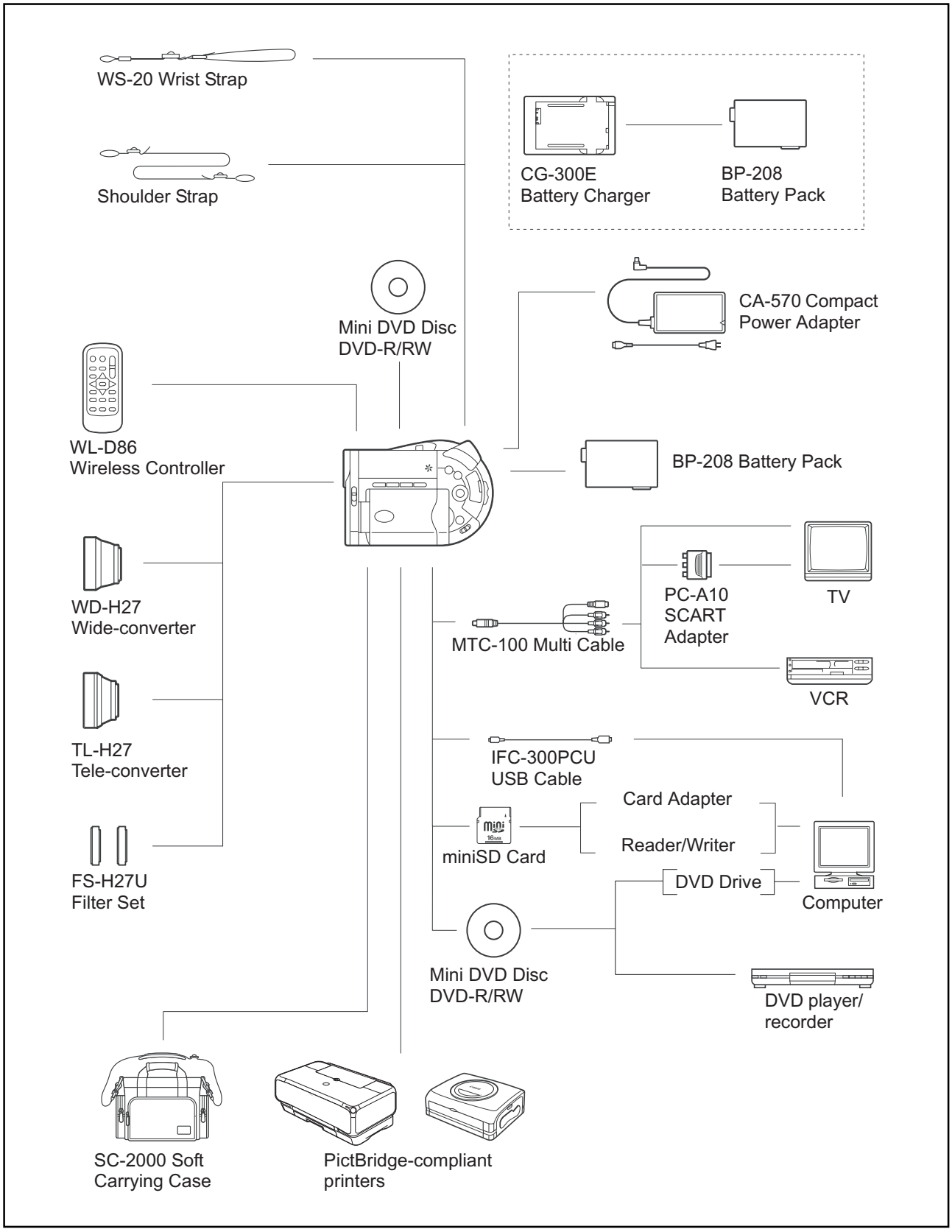


Fig. 4

TECHNICAL DESCRIPTON

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1. PCB Functions

(1) MAIN PCB

System-Control Section

• IC100	SUB MI-COM	Low-voltage system control (POWER KEY detection, memory backup, internal clock, charging)
• IC101	CCM MI-COM	System control (Camera/Card/Mode)
• IC103	FLASH	Flash-ROM for CCM MI-COM (8Mbit)
• IC104	3.2V REGULATOR	Power source for the SUB MI-COM and rechargeable power source for the lithium battery
• IC105	RESET IC	SUB MI-COM resetting
• IC106	AND GATE	Ready signal for serial communication between CCM MI-COM and LAP and DIGIC DV.
• IC810	AUDIO PLL	Master clock signal generation, audio signal output

Camera/Card Section

• IC1000 (DC20 E)		
	CDS/AD	2ch CCD output signal sampling, A/D converter
• IC1001 (DC10 E)		
	INVERTER	Oscillation circuit inverter
• IC1001 (DC20 E)		
	TG	CCD horizontal transfer pulse generation
• IC1002 (DC10 E)		
	TG/CDS/AGC/AD/V-DRIVER	2ch CCD output signal sampling, A/D converter, CCD horizontal transfer pulse generation
• IC1002 (DC20 E)		
	MPX2	AGC, image composition, flaw correction
• IC1004 (DC10 E)		
	2.8V REGULATOR	2.8V regulator
• IC1101	SDRAM	Memory for DIGIC DV (64Mbit)
• IC1102	SDRAM	Memory for DIGIC DV (64Mbit)
• IC1103	DIGIC DV	Camera digital signal processing, card image processing
• IC1200	LENS DRIVER	Zoom, focus motor driver, IRIS driver, and gyro output amp
• IC1400	LAP Lens actuator processor	
• IC1401	1.8V REGULATOR	1.8V regulator

Shock Proof section

• IC1650	SHOCK SENSOR	Shock sensor
• IC1651	SENSOR IC	Shock sensor IC
• IC2102	75OHM DRIVER	75Ω Video driver

BACK END section

• IC2300	BACK END	DVD signal processing LSI, FRONT END control (ATAPI), BACK END MI-COM, LCD/CVF control
• IC2301	SRAM	DVD control, DVD management data, DVD backup (16Mbit)
• IC2302	BUFFER	Buffer for SRAM-CS
• IC2303	FLASH	Flash-ROM for BACK END MI-COM (64Mbit)
• IC2304	DDR SDRAM	Memory for BACK END (CODEC) (128Mbit)
• IC2305	DDR SDRAM	Memory for BACK END (CODEC) (128Mbit)
• IC2306	DDR SDRAM	Memory for BACK END (ATAPI Communication) (512Mbit)

PM section

• IC3200 (DC20 E)		
	3.1V REGULATOR	3.1V regulator
• IC3201	DC/DC CONVERTER CONTROL	Power PWM regulator controller
• IC3203	4.6V REGULATOR	4.6V regulator

USB section

- IC3500 USB IC USB I/F

(2) SUB PCB

- IC1501 CVF DRIVER CVF signal processing and drive
- IC1502 2.8V REGULATOR 2.8V regulator
- IC801 AIF4 Analog input/output signal processing, speaker amplifier

(3) CCD PCB

- IC1050 (DC20 E) INVERTER CCD horizontal transfer pulse inverter
- IC1051 (DC20 E) INVERTER CCD horizontal transfer pulse inverter
- IC1052 (DC20 E) INVERTER CCD horizontal transfer pulse inverter
- IC1053 (DC20 E) INVERTER CCD horizontal transfer pulse inverter
- IC1054 (DC20 E) CCD CCD image sensor
- IC1055 (DC20 E) OPE AMP CCD output amp
- IC1070 (DC10 E) CCD CCD image sensor
- IC1071 (DC10 E) BUFFER CCD horizontal transfer pulse buffer
- IC1072 (DC10 E) BUFFER CCD horizontal transfer pulse buffer

(4) LCD PCB

- IC901 EEPROM EEPROM for LCD data
- IC902 LCD DRIVER LCD signal processing and drive
- IC903 2.8V REGULATOR 2.8V regulator

(5) GYRO PCB

- IC1603 P SENSOR GYRO Pitch-direction angular speed detection
- IC1604 Y SENSOR GYRO YAW-direction angular speed detection

(6) FLASH PCB (DC20 E only)

- IC501 DC/DC CONVERTER CONTROL Control for main capacitor charging

(7) CVF PCB

Signal transfer from the SUB PCB to the CVF, CVF Backlight LED

(8) DC JACK PCB

DC JACK

(9) CARD PCB

Memory card slot, lithium secondary battery

(10) AV FPC

Multi JACK

(11) USB FPC

USB JACK

(12) TS MACH

FRONT END (Pickup, spindle, control PCB)

2. Power Supply Circuit

2-1 Startup of Power Supply

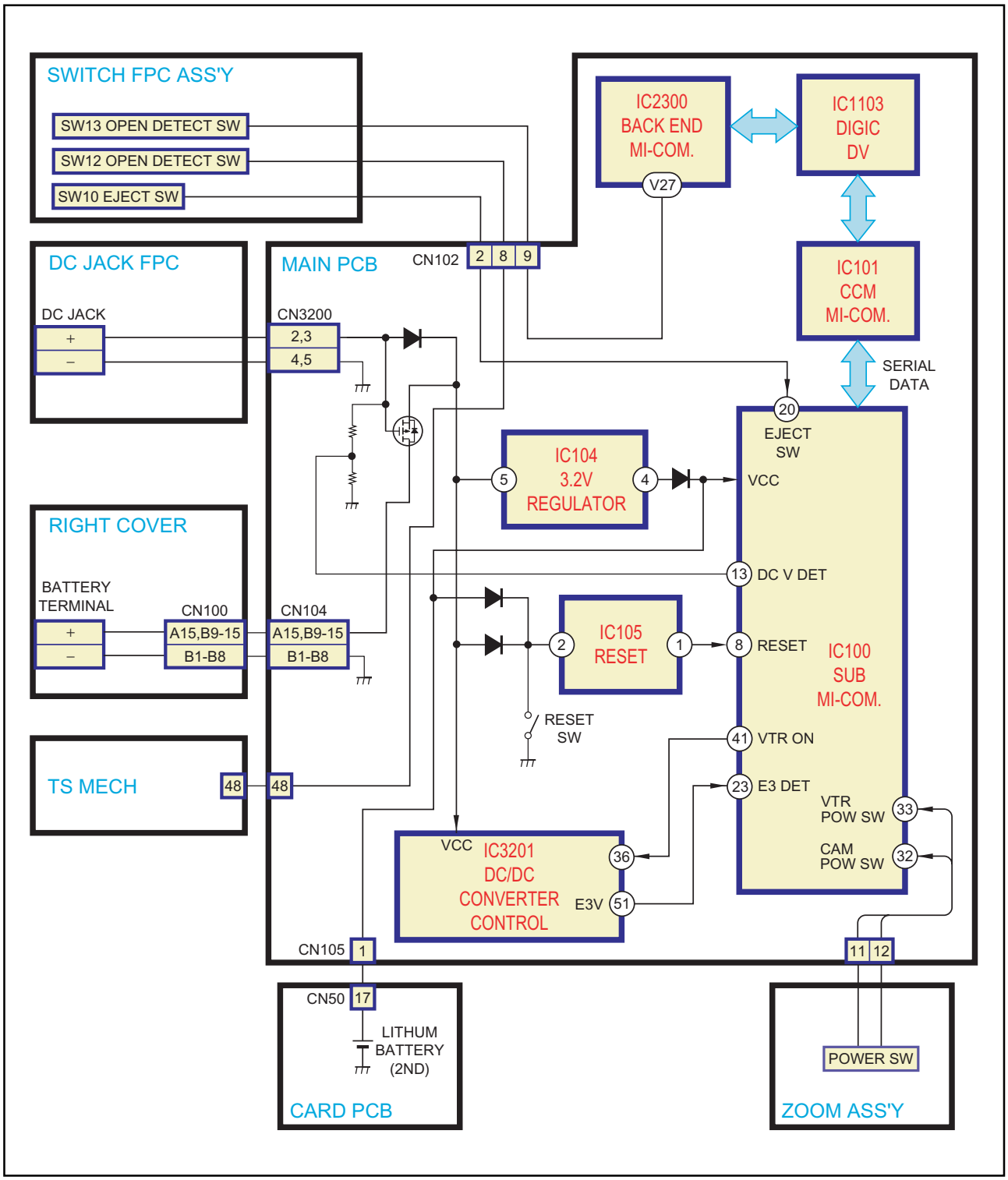


Fig. 1

• Backup Lithium Battery

2.5V power from the lithium secondary battery is supplied to the SUB MI-COM. Thus, the SUB MI-COM performs data backup and clock operation when the main power supply is not connected.

Charging time (from empty state)	Charging capacity	Backup period
17.5 h	70%	2.7 months
24 h	80%	3.1 months
43 h	100%	3.9 months

• Main Power Supply

Main power (DC JACK/BATTERY) is supplied to IC3201 (DC/DC CONVERTER CONTROL). Through the internal regulator in the IC3201, the main power thus supplied is converted 3V power, which is output as E3V from pin 51 of the IC3201.

On output of the E3V power, the SUB MI-COM recognizes that the main power supply has been connected, and then performs initialization and is brought into the standby status. Then, the SUB MI-COM carries out initialization and sets up the standby state. In this state, the SUB MI-COM performs detection of startup-related switches. When it detects that any one of the startup-related switches has been turned on, the VTR ON (H) signal is output form pin 41. Upon output of the VTR ON (H) signal, power to each circuit is turned on.

When power is fed from the main power supply, 3.2V power is output from pin 4 of the IC104. Instead of power from the lithium secondary battery, the 3.2V power output from pin 4 of the IC104 is supplied to the SUB MI-COM. This 3.2V power is also used for recharging the lithium secondary battery. Shown below is the relationship between the charging time and the charging capacity:

* The values indicated below are for reference only. The actual values will vary depending on the operating environment.

2-2 Power Fuses

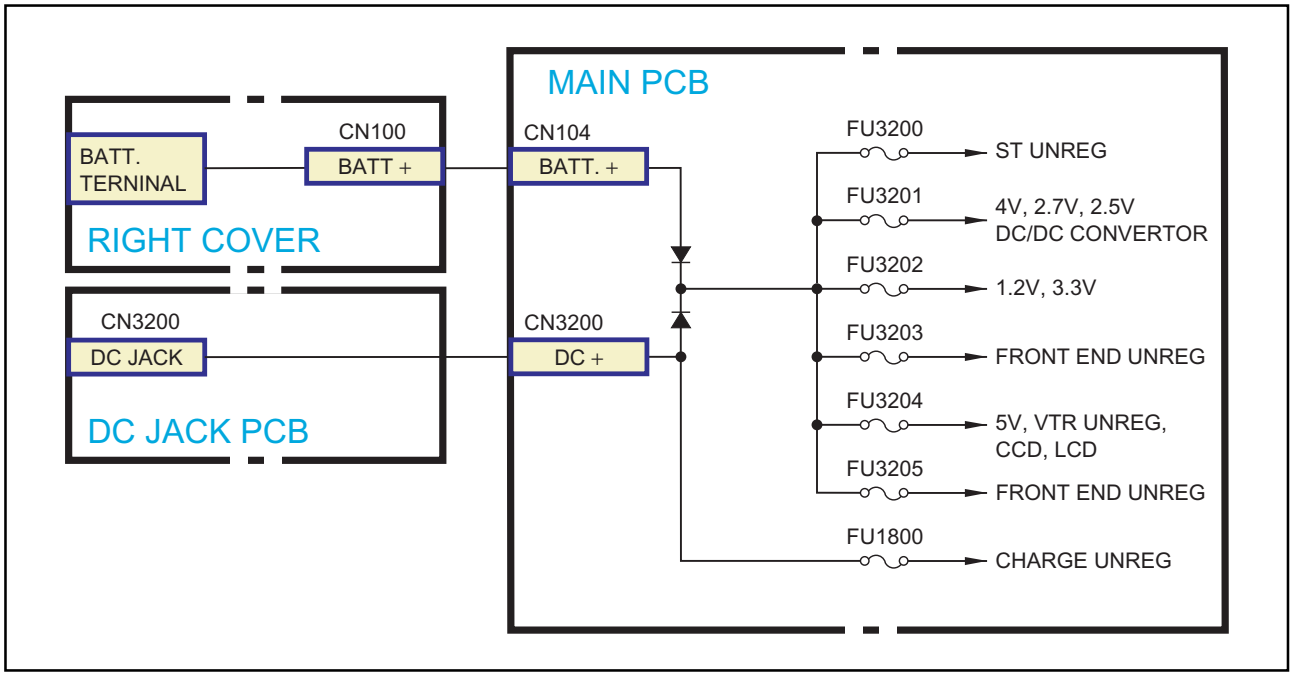


Fig. 2

The power supply from the battery DC JACK is supplied to seven fuses on the MAIN PCB, through which the following seven power voltage are delivered.

(1) ST UNREG : FU3200
- Main capacitor charging power source for flash memory (DC20 E only)

(2) 1.4V + 2.7V + 2.5V + DC/DC : FU3201
- 1.4V power source (MACS1.4V, DVDD1.4V, AVDD1.4V)
- 2.7V power source (CAM2.7V [DC20 E only], DVDD2.7V, PLL2.7V, AVDD2.7V, AA2.7V, HTG2.7V [DC20 E only])
- 2.5V power source (DVDD2.5V, DDR2.5V, SDRAM2.5V)
- DC/DC CONVERTER power source

(3) 1.2V + 3.3V : FU3202
- 1.2V power source (PRISM1.2V)
- 3.3V power source (LCD3.3V, USB3.3V, FLASH SRAM3.3V, DVDD3.3V, AVDD3.3V)
- CCD drive IC power source (DC10 E:CAM3.3V, DC20 E:CAM3.5V)

(4) FRONT END UNREG : FU3203
- FRONT END power source

(5) 5V + VTR UNREG + CCD + LCD : FU3204
- 5V power source (P5V, LCD5V, AA4.7V)
- VTR UNREG
- CCD drive power source (CCD15V, CCD-7V)
- LCD drive power source (LCD8.5V, BL POW)

(6) FRONT END UNREG : FU3205
- FRONT END power source

(7) CHARGE UNREG : FU1800
- Battery Charge circuit power source

2-3 Power Supply Circuits

Figure 3 shows the power supply circuits.

The ON/OFF condition of each power supply voltage is controlled by the VTR ON signals output from the SUB MI-COM.

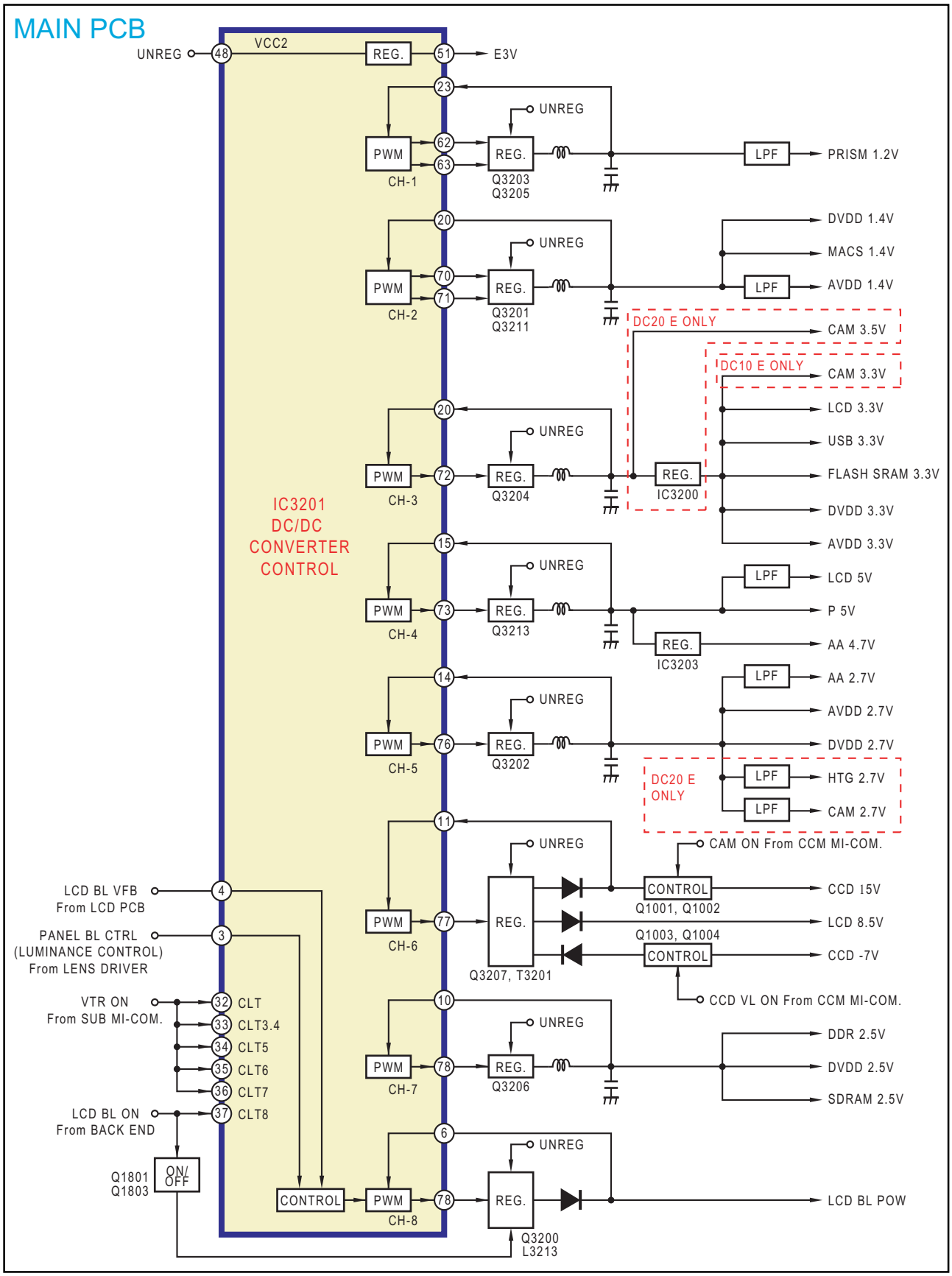


Fig. 3

3. Built-in Charger Circuit

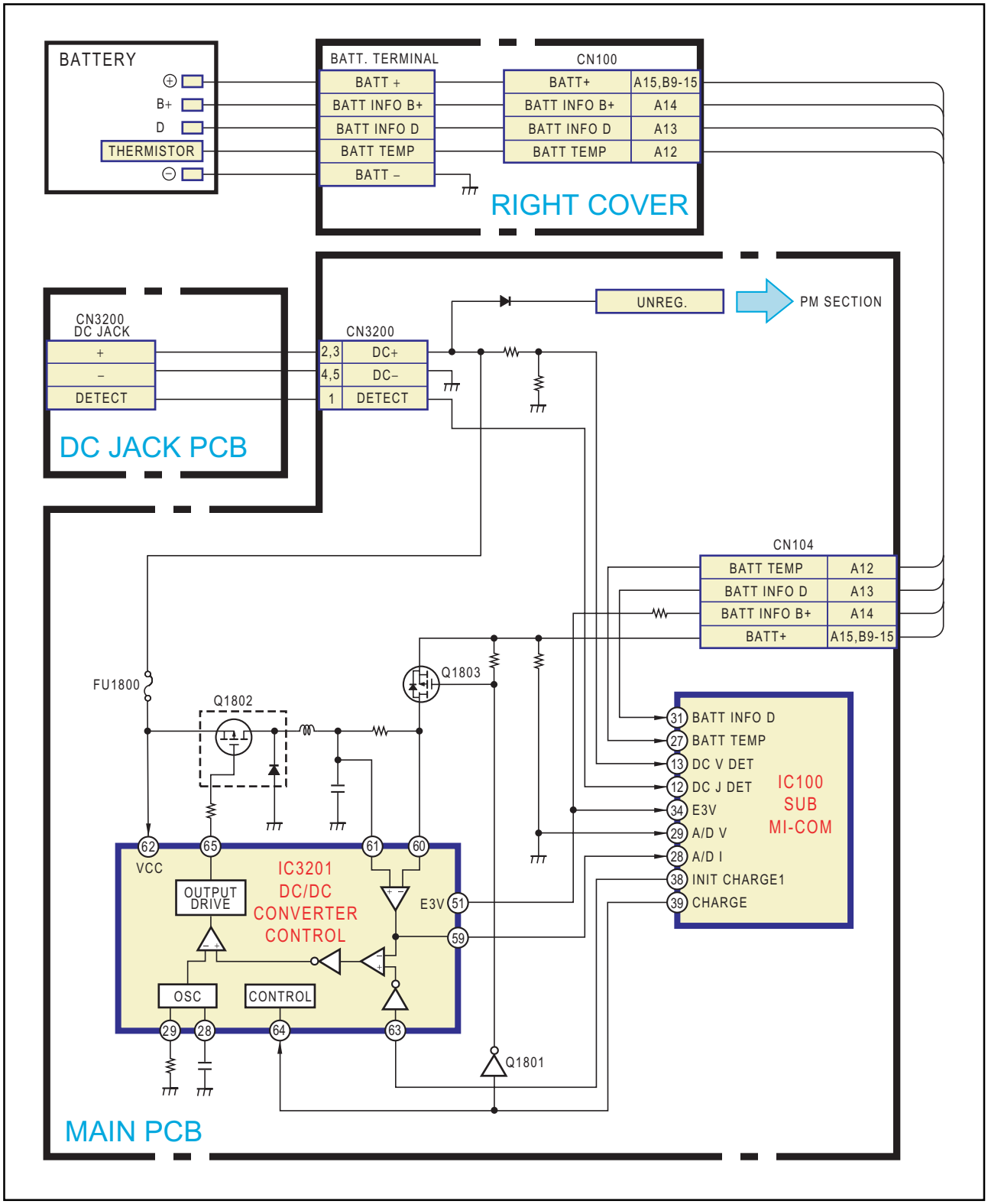


Fig. 4

3-1 Outline

The main circuit elements and their functions are as follows.

(1) IC100 (SUB MI-COM)
- Control of IC3201
- Error discrimination and display
- Detection and display of charging progress
- Detection of DC JACK connection and voltage
- Detection of internal battery temperature

(2) IC3201 (DC/DC CONVERTER CONTROL)
- Charging voltage/current control

3-2 Operation at Charging

3-2-1 Conditions to Start Charging

When the following conditions are satisfied, the SUB MI-COM (IC100) controls the IC3201 and starts charging.
If the conditions shown in (4) and (5) above are not satisfied or if the type in (6) could not be confirmed, a charge error is indicated.

	Conditions	Detection	Source of detection
1	Main unit power is turned OFF	SUB MI-COM	-
2	DC jack is connected.	SUB MI-COM pin 12 DC J DET	DC JACK
3	Power supplied from DC jack	SUB MI-COM pin 13 DC V DET	DC IN
4	UNREG voltage is 8.4 ±0.3 V.	SUB MI-COM pin 26 BATT.A/D	UNREG.
5	Battery temperature is within the range of -6.8°C to 49.3°C.	SUB MI-COM pin 27 BATT.TEMP	Battery T terminal
6	Confirmation of the type of the battery connected	SUB MI-COM pin 31 BATT.INFO D	Battery D terminal

3-2-2 Progress of Charging

The IC3201 starts a trickle charge under control of the SUB MI-COM (IC100). The trickle charge continues until the battery voltage reaches 6.17V. At the point when 6.17V is reached, the IC1800 starts a 808 mA quick charge. Then, the charge current decreases gradually with the progress of charging (because of an increase in impedance of the battery). When the charge current becomes 70 mA or less, the end-of-charging indication is provided. Thereafter, supplementary charging is performed for 90 minutes at maximum until the charge current becomes 34 mA or less.

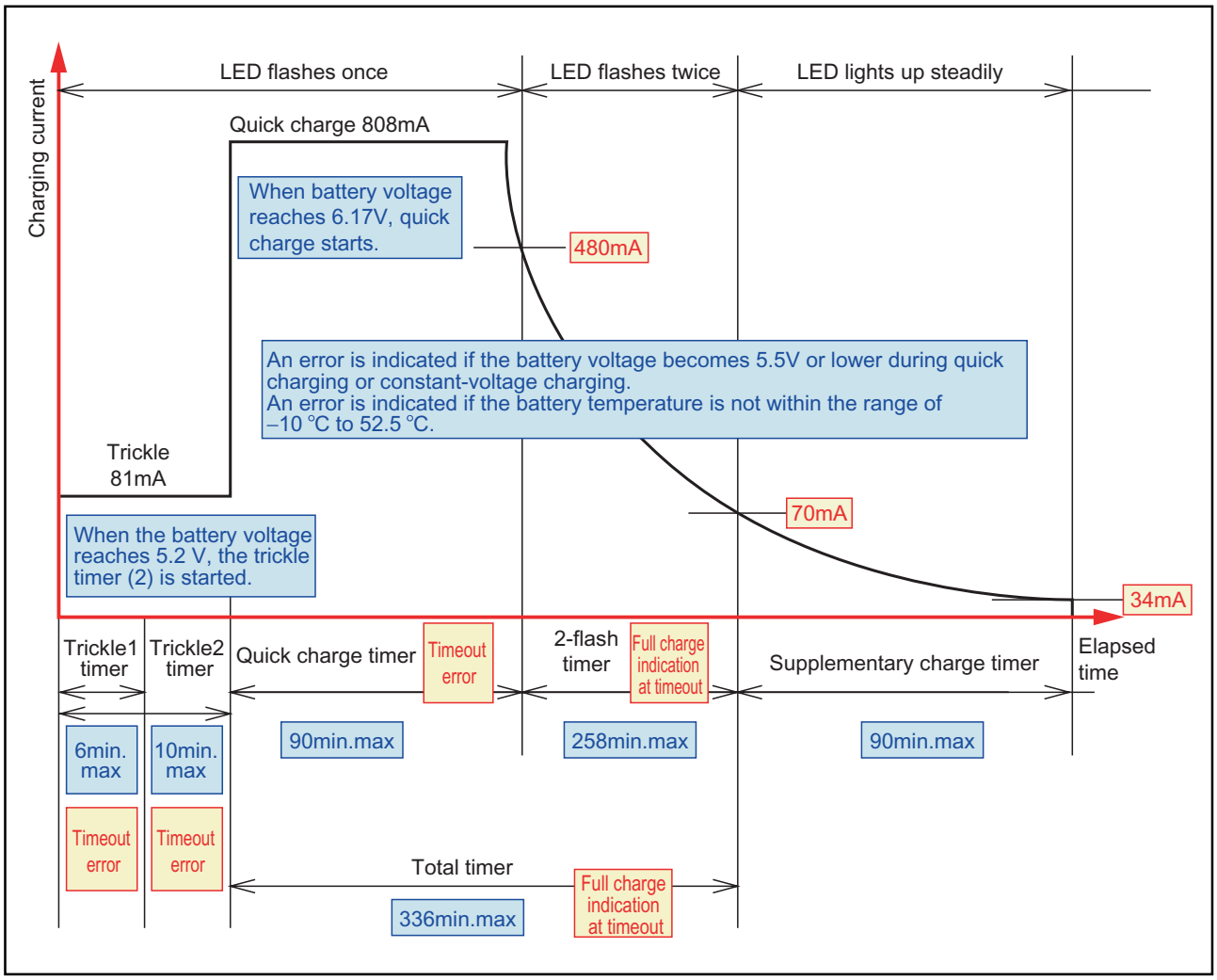


Fig. 5

4. Signal Processing Circuit

4-1 Outline of Signal Processing Circuit

4-1-1 DC10 E Outline of Signal Processing Circuit

Figure 6 shows the entire block diagram of the signal processing circuit and the flow of video and audio signals.

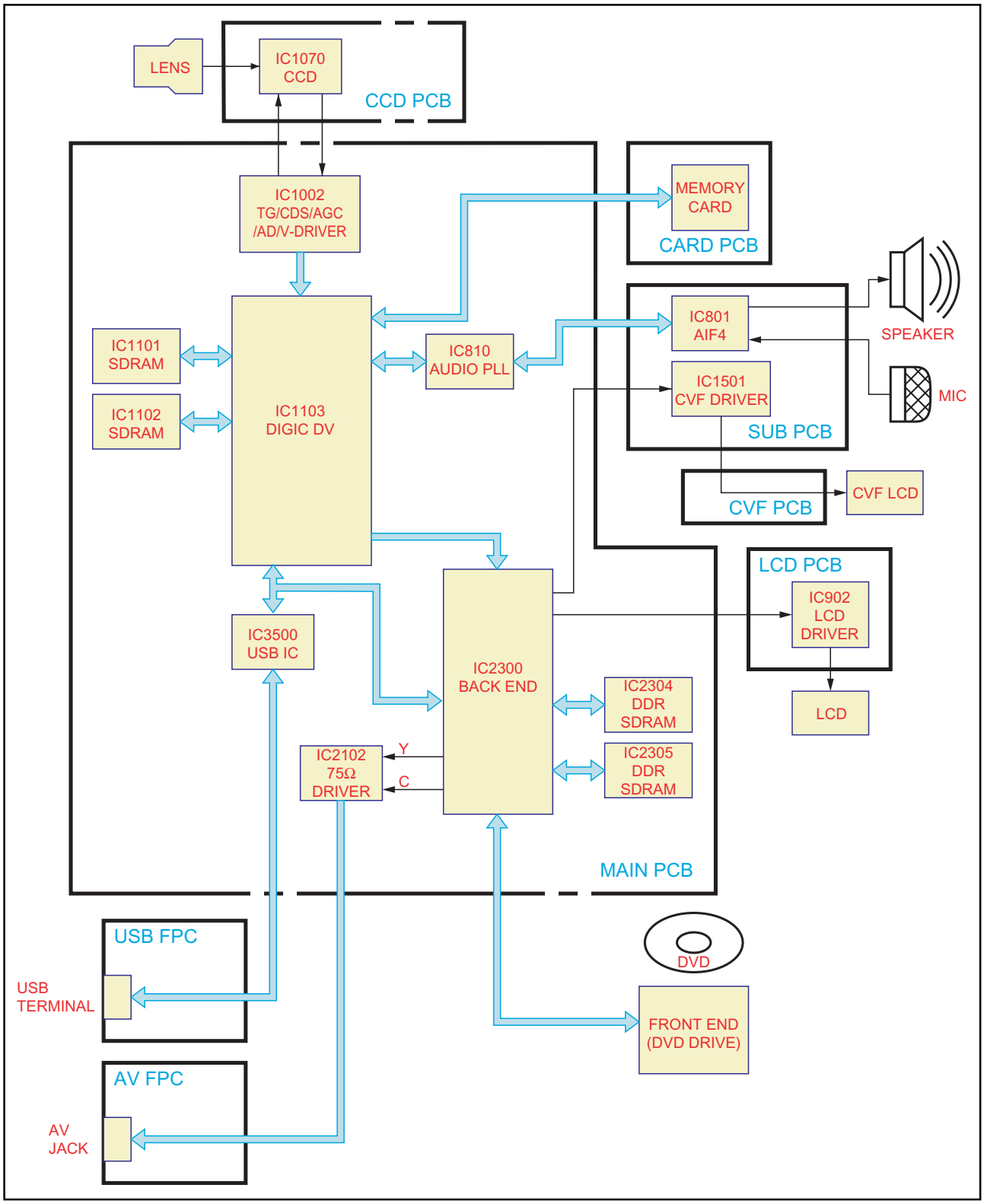


Fig. 6

4-1-2 DC10 E Outline of Signal Processing Circuit

Figure 7 shows the entire block diagram of the signal processing circuit and the flow of video and audio signals.

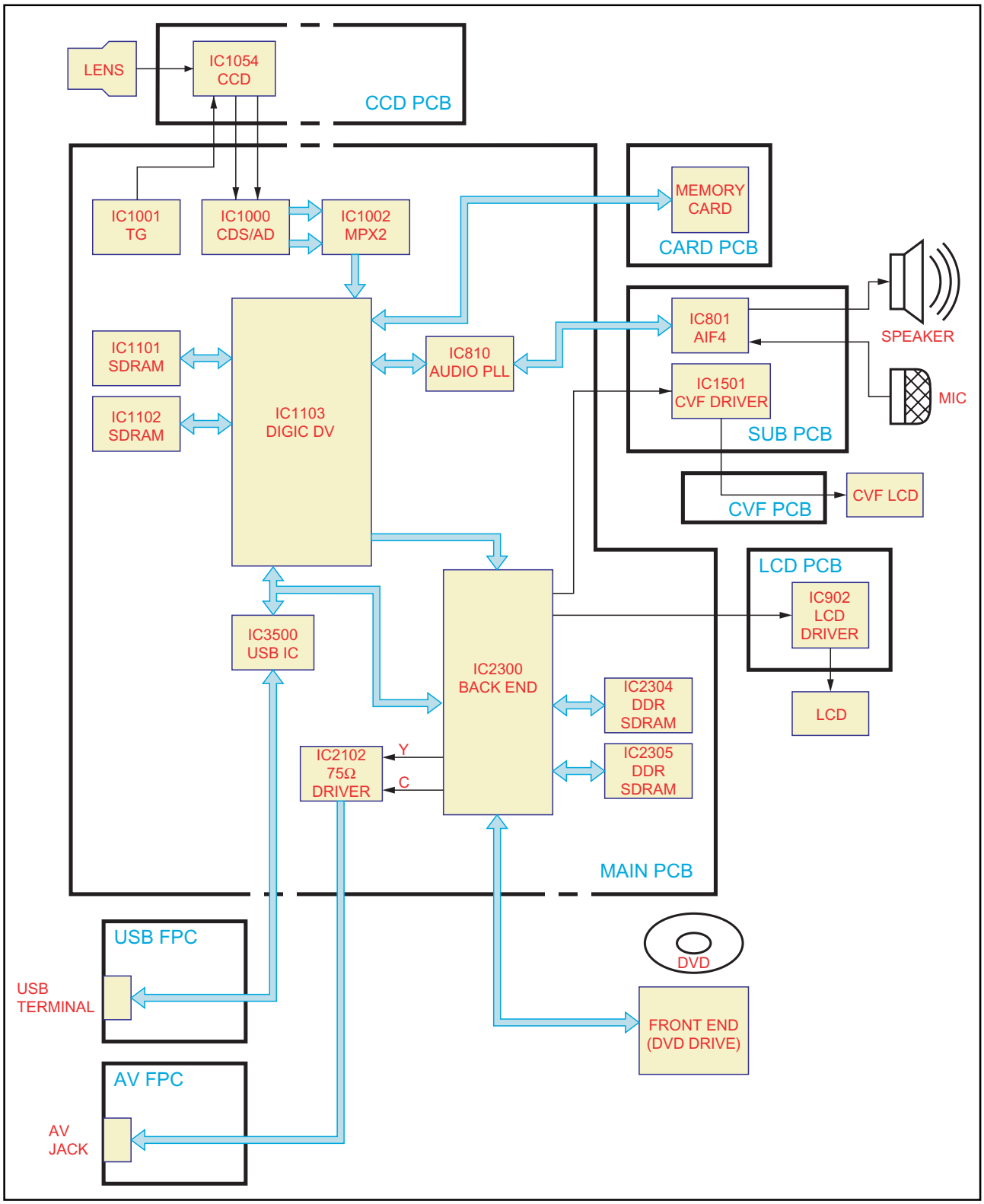


Fig. 7

4-2 Camera/Card Signal Processing (DC10 E)

4-2-1 Camera Motion Picture Recording

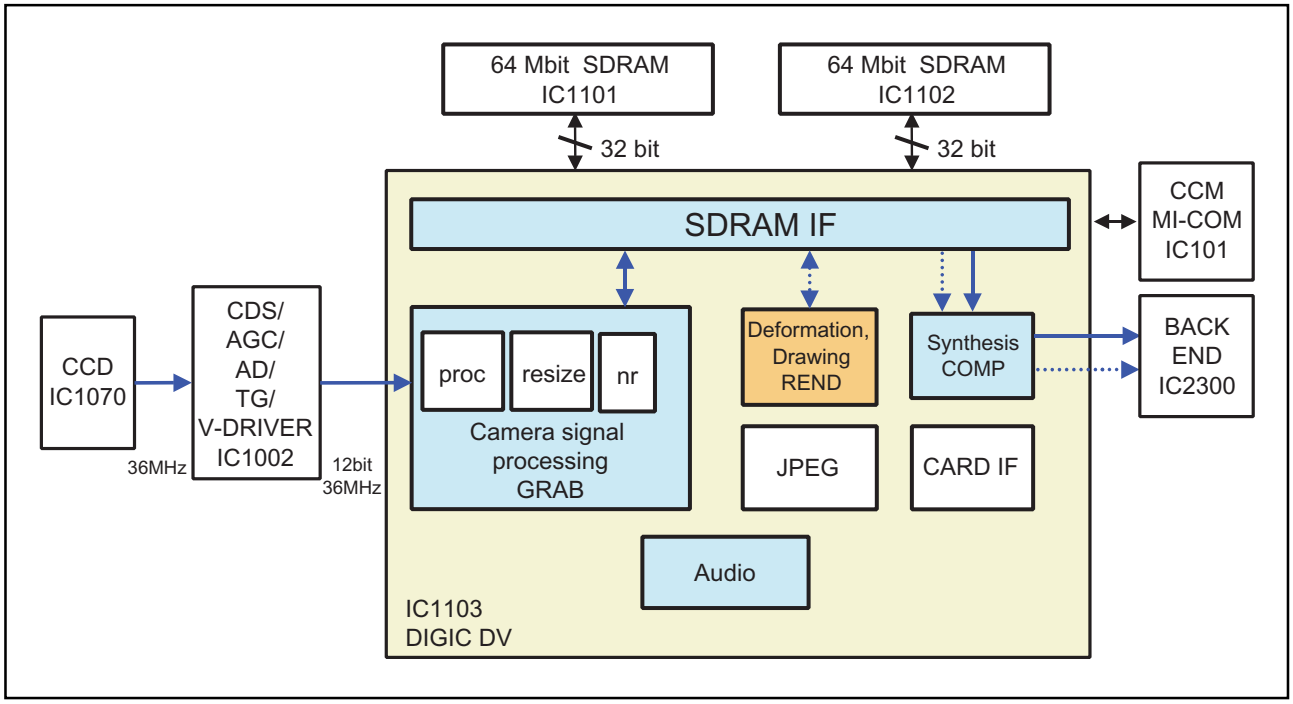


Fig. 8

4-2-2 Card Still Picture Recording

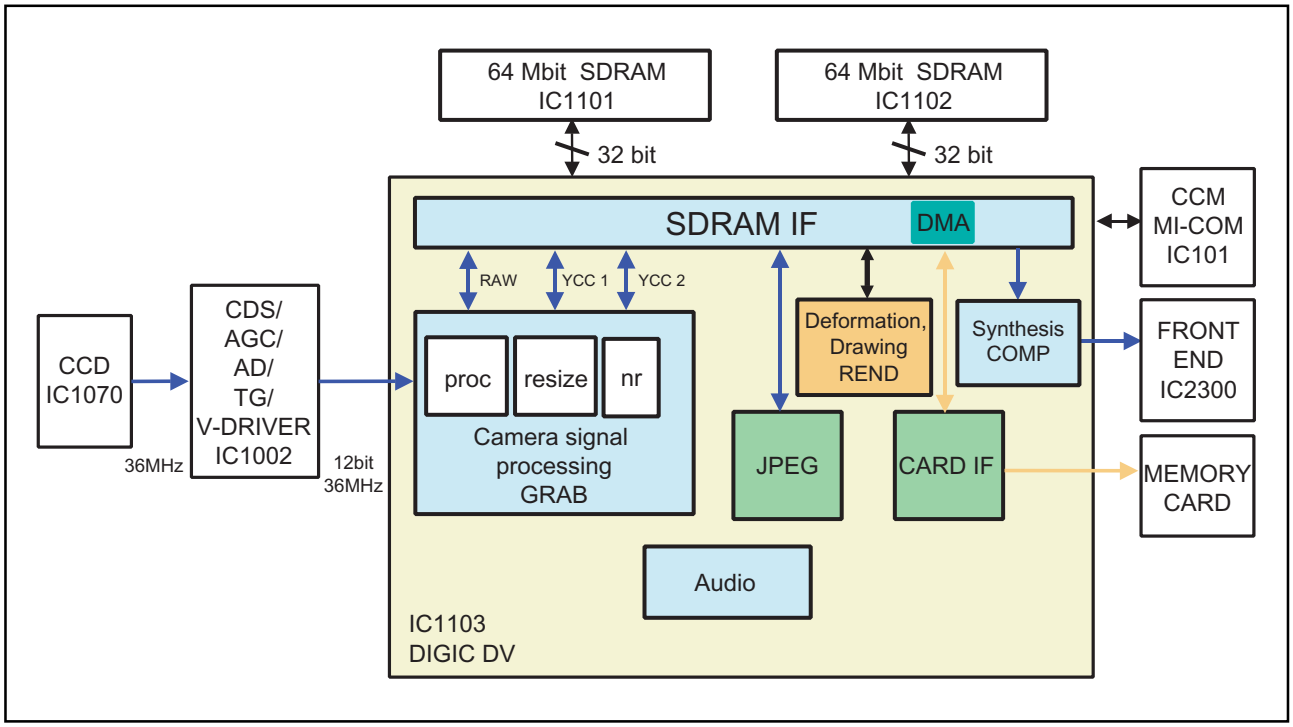


Fig. 9

<CCD> IC1070

- 1/4-inch interlaced CCD
- Complementary color filter
- Total number of pixels : Approx. 1,330,000
  Effective number of pixels : Tape : Approx. 690,000
  : Tape : Approx. 1,230,000

<CDS/AGC/AD/TG/V-DRIVER> IC1002

A signal read out of the CCD is extracted. Then, after the extracted signal is subjected to AGC processing and A/D conversion, it is output as a digital signal.

<DIGIC DV> IC1103

This circuit carries out various camera signal processing operations (EIS, AWB, etc.) and digital effect processing. It also performs multimedia-application signal processing mainly for still image recording.

- Feature engine
- High-speed card interface
- JPEG method compression/extension
- Audio data compression (ADPCM)
- USB function

<SDRAM> IC1101, IC1102

Field memory for camera signal processing and digital effect processing
Image data memory for Memory card write/read operation

4-3 Camera/Card Signal Processing (DC20 E)

4-3-1 2-Megapixel Camera System

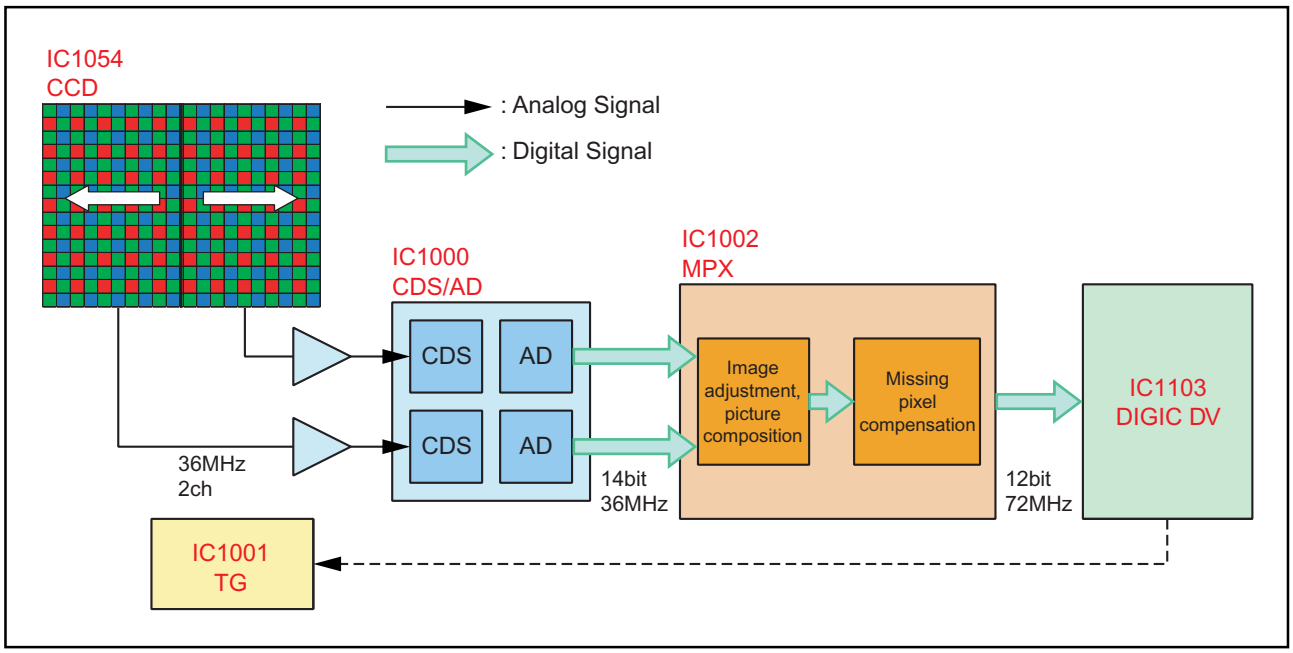


Fig. 10

This model handles the increased CCD picture element readout by splitting the CCD into right and left halves and having two circuit systems for readout, as shown illustrated above.
The two systems of video signal are distinctly subjected to A/D conversion, are composed into a single image by MPX-IC, and are sent to DIGIC DV for camera signal processing.

4-3-2 Camera Motion Picture Recording

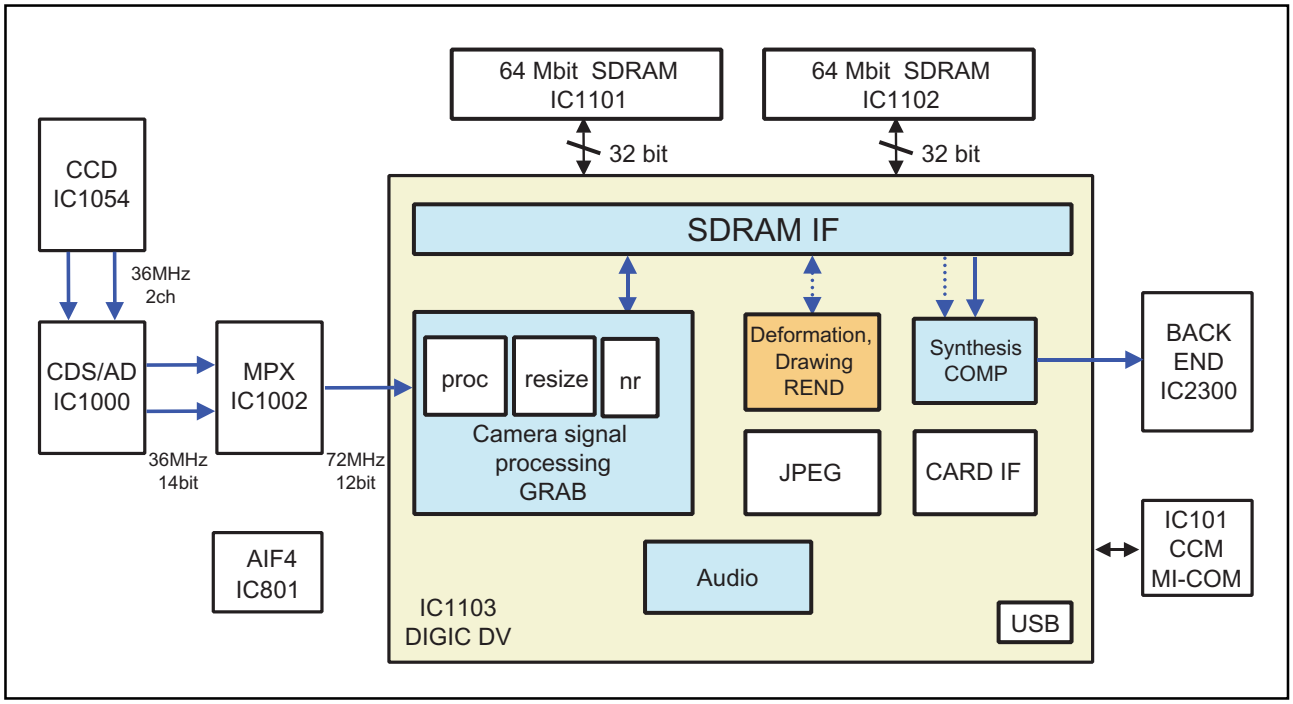


Fig. 11

4-3-3 Card Still Picture Recording

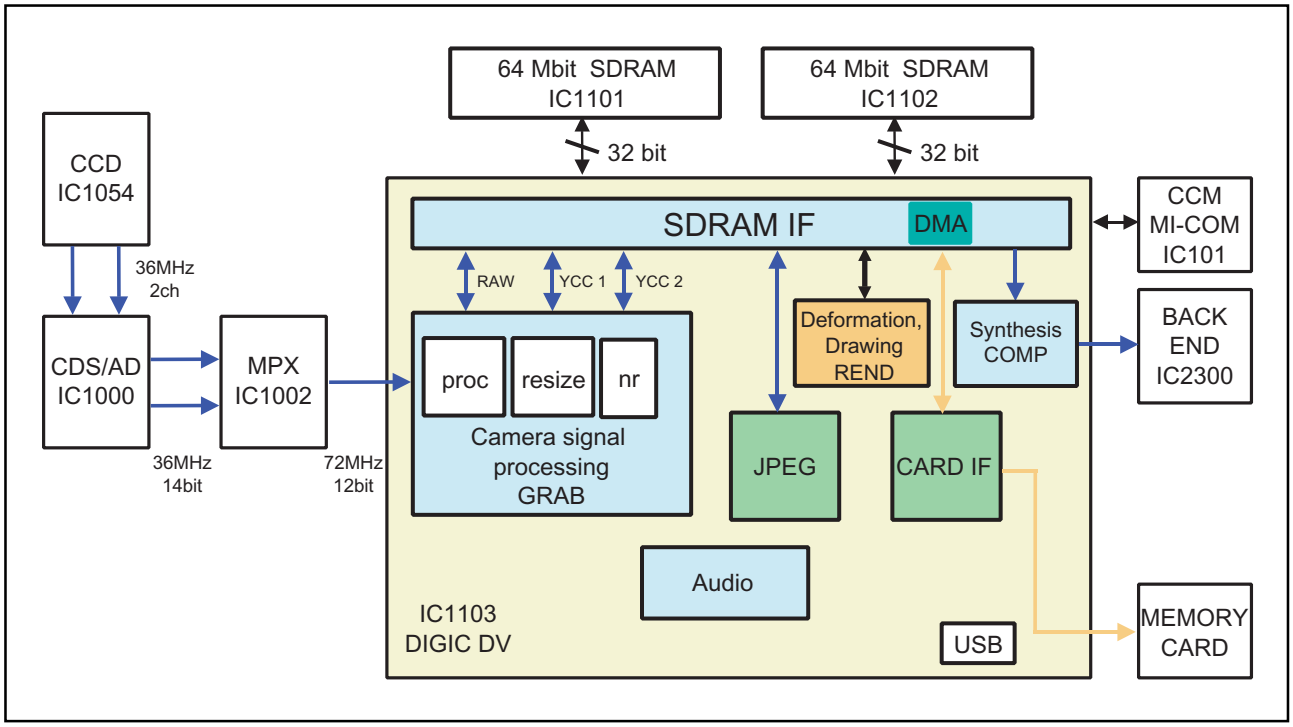


Fig. 12

<CCD> IC1054 / CCD PCB

- 1/3.9-inch interlaced CCD
- RGB primary color filter
- Total number of pixels : Approx. 2,200,000
  Effective number of pixels : Approx. 1,230,000 for tape recording
  : Approx. 2,000,000 for card recording

<CDS/AD> IC1000 / MAIN PCB

Extracts signals read through 2 left and right channels from CCD, eliminates noise components, performs A/D conversion, and then outputs digital signal through 2 channels.

<MPX2> IC1002

Composes picture data input through 2 left and right channels, and corrects the offsets. Then performs AGC processing, corrects CCD missing pixels, and outputs the signal through 1 channel.

<DIGIC DV> IC1102

Performs different camera signal processing (EIS, AWB, etc.) and digital effect processing. Also performs signal processing for coping with multimedia centered on still picture shooting.

- Feature engine
- High-speed card interface
- JPEG method compression/extension
- Audio data compression (ADPCM)
- USB function

<SDRAM> IC1101/1102

Memory for DIGIC DV

4-4 Recorder Signal Processing

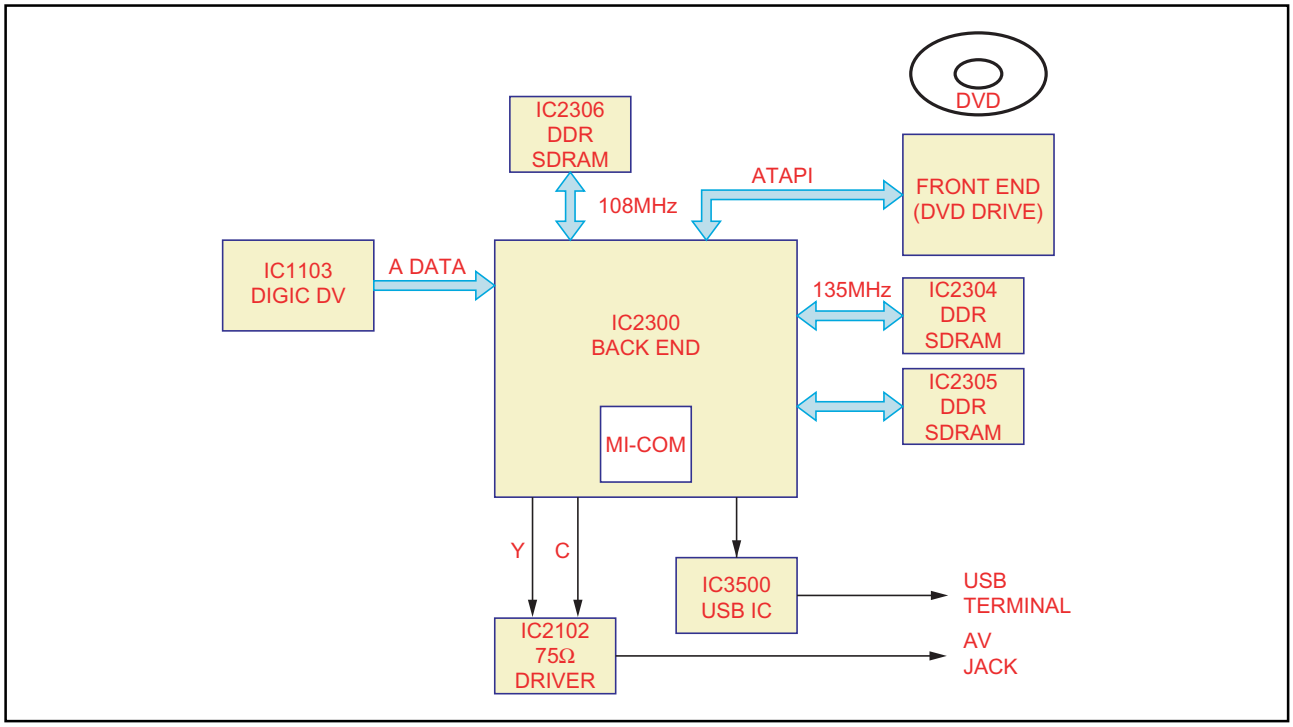


Fig. 13

< BACK END >IC2300

- The DVD coding circuit and MI-COM circuit are integrated in a single chip.
- Video/audio data is coded through use of the IC2304 and 2305 (DDR SDRAM).
  The internal MI-COM circuit carries out front-end (DVD drive) control.
  The recorded signals to DVD (read-out) are handled by the front end through ATAPI communication for which the IC2306 (DDR SDRAM) is mainly used.

< FRONT END>DVD DRIVE

- At the time of recording, video/audio data fed from the back end is modulated to DVD recording data, and a DVD write control operation is performed.
- At the time of playback, data is read out from DVD, and demodulation is performed together with error correction.

4-5 Audio Signal Flow

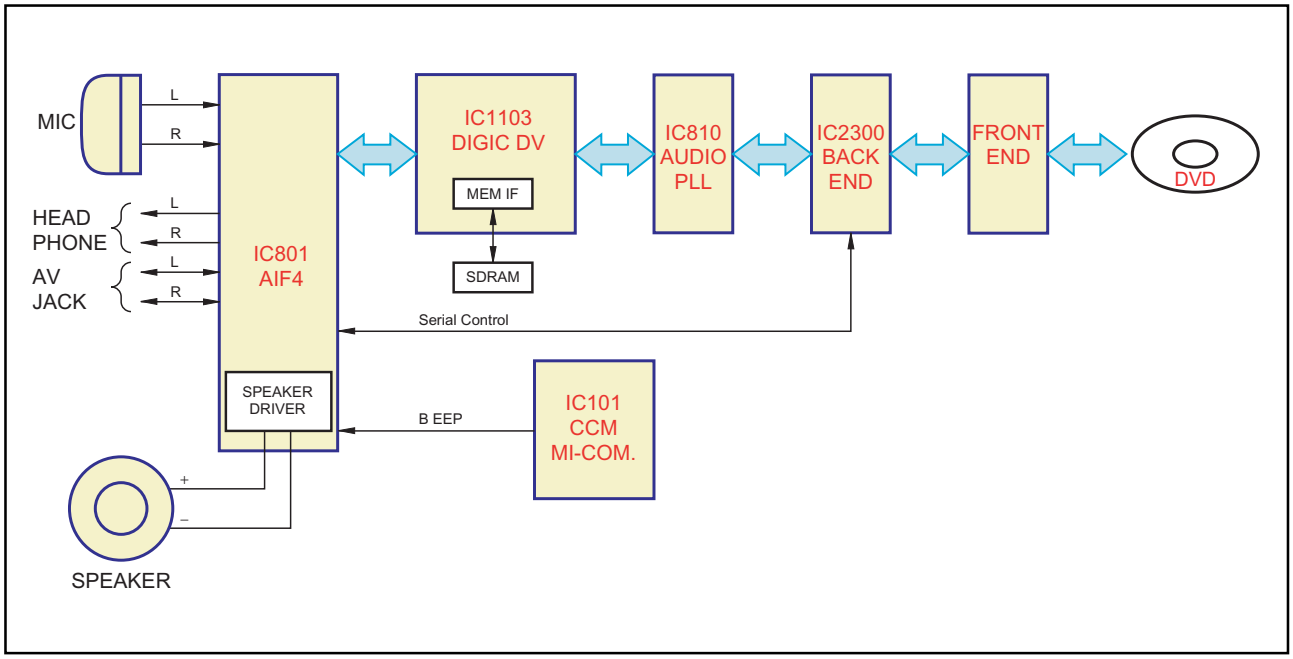


Fig. 14

< AIF >IC801

Out ALC (Auto Level Control), fading, and amplification of various output signals. For the beep tone issued at ejection, etc., the signal from the CCM MI-COM is generated in the circuit and changed over in the AIF.

The microphone amplifier, HPF, ALC, A/D, D/A, and digital I/F, SPEAKER DRIVER with ALC circuits are contained in this IC. It is also used for changeover between ordinary voice sounds and beep sounds.

< BACK END >

At the time of recording, audio digital signals are compressed into a Dolby AC-3 form.

At the time of playback, demodulation processing is performed for inversion.

5. System Control

5-1 Outline of System Control

System control is performed by the CCM MI-COM (IC101), BACK END MI-COM, and SUB MI-COM on MAIN PCB.

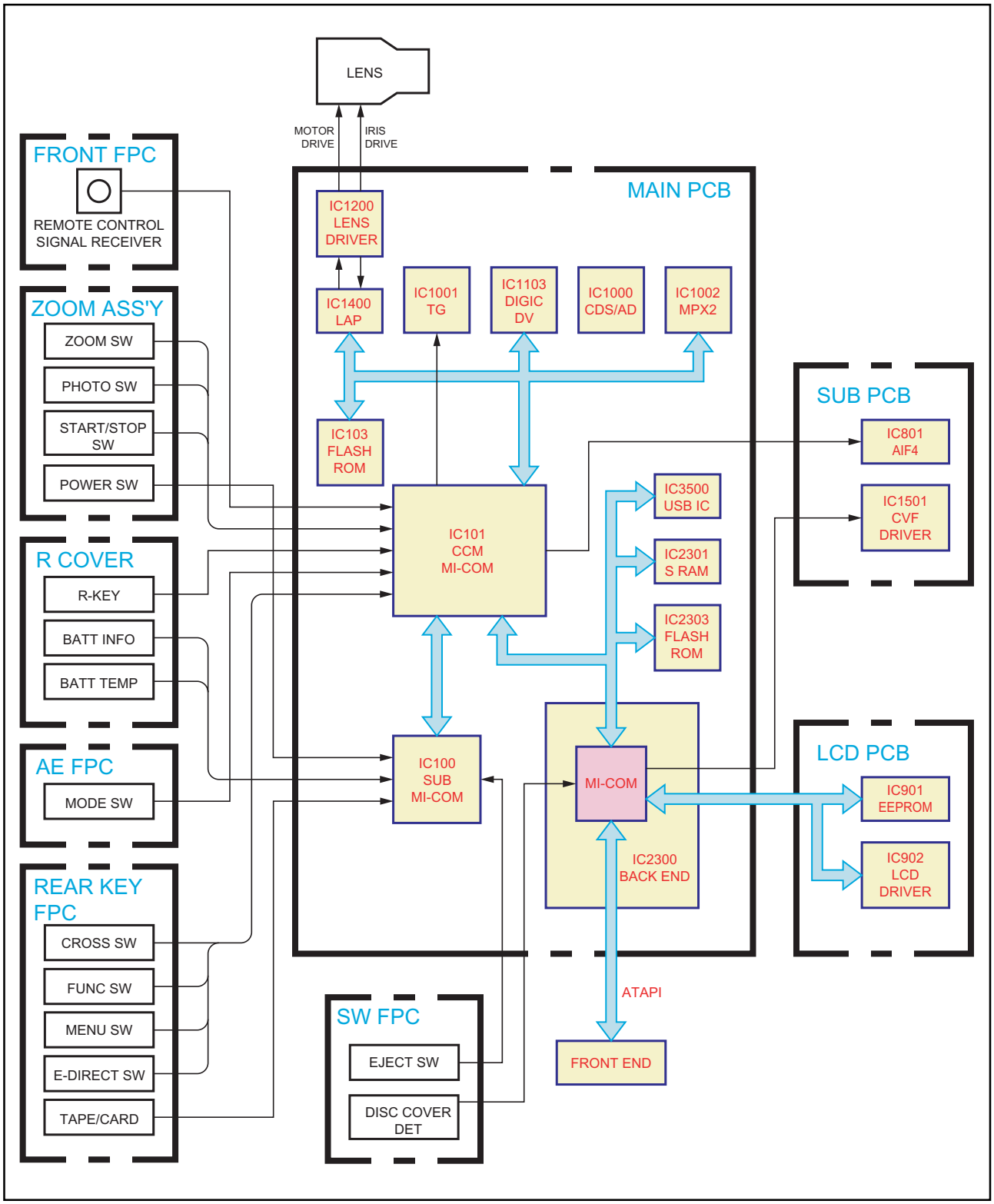


Fig. 15

5-2 Major Functions of Each MI-COM

(1) CCM MI-COM (IC101)

The major functions of the CCM MI-COM are listed below.

- Key input
- Remote control input
- USB interface control (In Card mode)
- DIGIC DV control
- Card control
- CCD drive control
- AE, AF, AWB control
- EIS (Electric Image Stabilizer) control
- PRINTER control

(2) SUB MI-COM (IC100)

The major functions of the SUB MI-COM are listed below.

- Power ON/OFF control
- Built-in charge circuit control
- Built-in clock

(3) MI-COM in BACK END (IC2300)

The major functions of the MI-COM in BACK END are listed below.

- Front end (TS mech) control through ATAPI communication.
- USB interface control (In movie transmission)
- OSD (On Screen Display) Bitmap control
- LCD/EVF control

5-3 Personal Computer Connection Mode (USB)

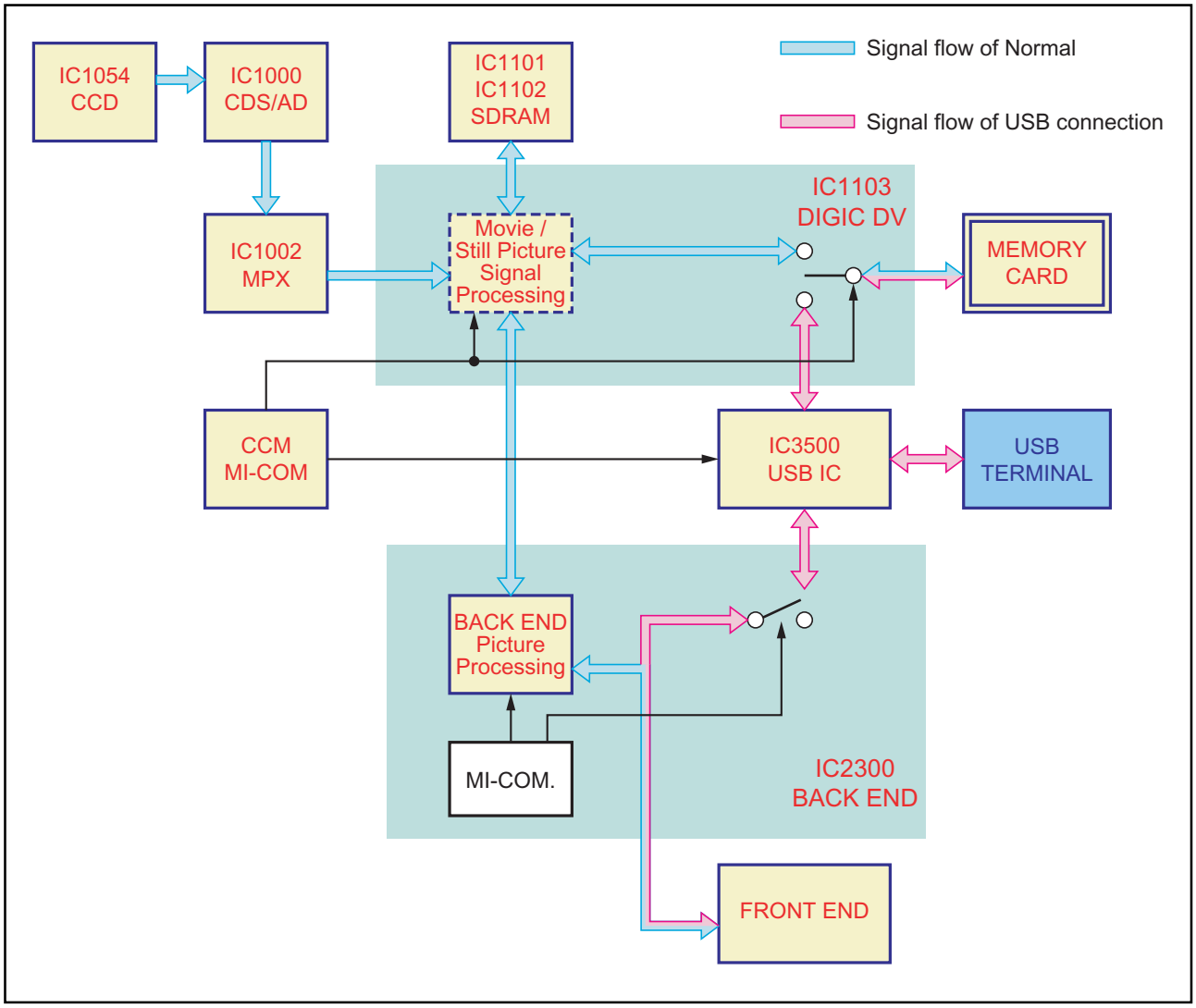


Fig. 16

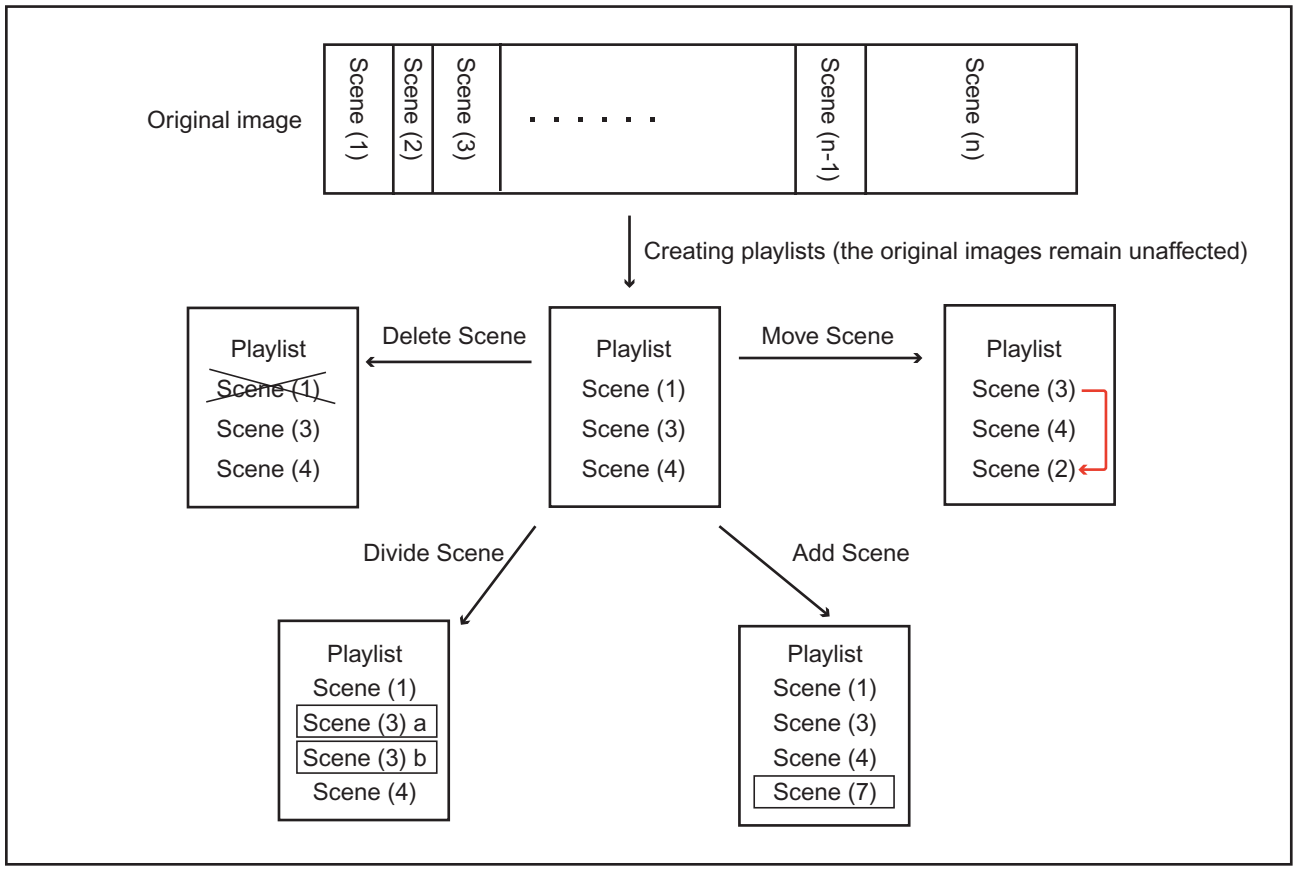
In the normal status, the video signals generated by the camera section are sent to the memory card via the DIGIC DV and also to the front end via the back end.

For USB connection, the USB terminal is connected to the memory card through the USB IC and DIGIC DV in the still picture mode. In the movie mode, the USB terminal is connected to the front end through the USB IC and back end.

6. Disk functions

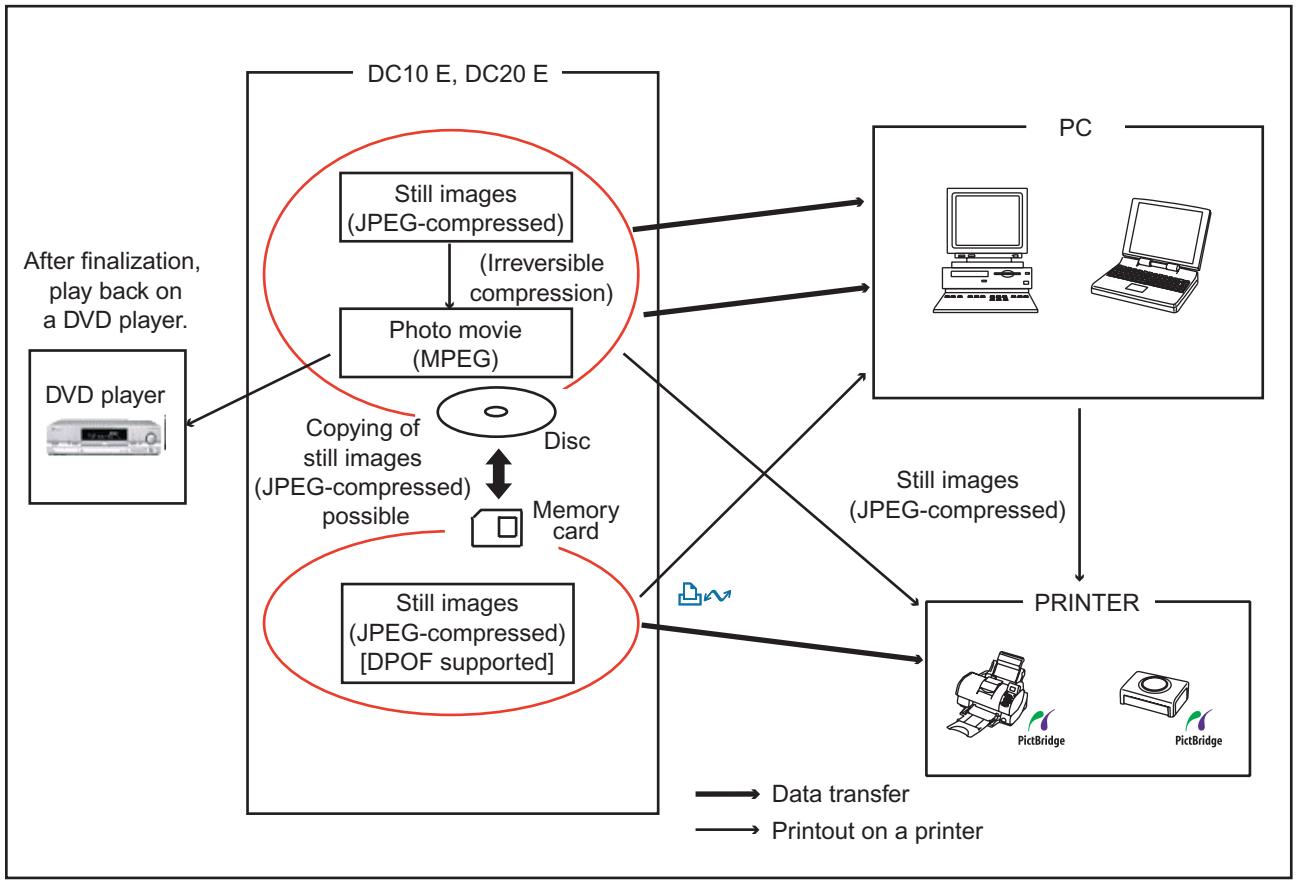
6-1 Playlist editing Functions

The DC10 E and DC20 E are equipped with disc-editing functions for making simple edits to original images and for editing playlists. Below is the conceptual diagram showing the playlist-editing functions for deleting, moving, dividing, and adding scenes.
The playlist refers to a list prepared by selecting desired scenes from the original images (motion video). Only DVD-RW can be used (VR mode).
Here, a scene refers to a single scene shot from the start of recording with a press of the record button to the stop of recording with the second press of the same button.



6-2 Still Image Shooting and Direct Print

The DC10 E and DC20 E have a function for recording still images on miniSD cards and DVD discs (both media are JPEG-compressed). It is possible to check the still images (JPEG-compressed) recorded by the DC10 E or DC20 E without finalizing the disc.
If the images recorded on the disc are to be played back on another DVD player or the like, they must be finalized. To enable still images in addition to video to be played back on a DVD player or the like, the still images must be converted into an irreversible MPEG motion video that is called "Photo movie". Only by making such conversion can still images be played back on a DVD player or the like. The images are played back one after another at intervals of approx. 3 seconds in the form of a slideshow on a DVD player. If the still images are to be edited using the playlist editing (VR mode) function provided for the DC10 E/DC20 E, the still images (JPEG-compressed) must be converted into Photo movies.
Even when the still images on the disc have been converted into Photo movies, they remain stored on the disc as JPEG-compressed images unless the original still images are erased. Using these still images, the DC10 E/DC20 E enables printout on a PictBridge-compliant printer. The DC10 E/DC20 E does not support non-PictBridge-compliant printers (with CP direct specification or Camera direct specification).
The DC10 E/DC20 E is also capable of recording still images (JPEG-compressed) on both discs and cards (miniSD), and the same image size and quality are featured by both of these media. The DC10 E/DC20 E also features a function to copy images from discs to cards and vice versa. Thus, to play back images on a DVD player or perform playlist editing on the DC10 E/DC20 E the still images shot and stored on the cards, these still images on the card must be copied to a disc and then converted into Photo movies.
Similarly, if DPOF-compliant printing is to be selected for the printing of the still images on the disc, the still images on the disc must be copied to the card and then processed.
The diagram below shows the relationships between the still images on the discs and on the cards.



DISASSEMBLING

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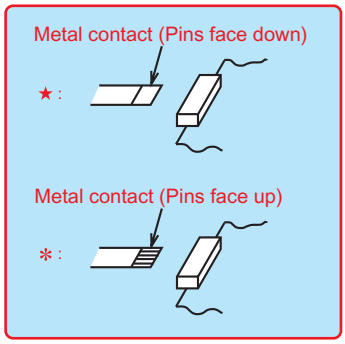
1. Disassembling and Reassembling

Notes

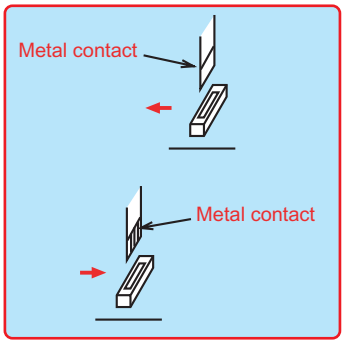
(1) When replacing the flat cable with a new one, allow it to remain folded the same as the original part.

(2) The flat cable has a contact orientation to be engaged with the connector. Refer to the instructions in the disassembly procedure diagram and interconnection diagram for boards.

- Lateral engaging connector
  (The instructions are given in the disassembly procedure diagram and board interconnection diagram.)
  ★ : Contacts are positioned downward. (board side)
  ＊ : Contacts are positioned upward.



- Lengthwise engaging connector
  (The instructions are given in the disassembly procedure diagram and board interconnection diagram.)
  Indicated by → Arrowheads indicate the contacts, and the shafts indicate the noncontacts.



(3) To secure screws, apply the Three Bond 1401C (CY9-8011-000).

(4) If any part to be replaced has UL tape attached on it, be sure to reattach the UL tape at the same position when reassembling.

(5) After detaching the REAR COVER, be sure to discharge the Main Capacitor.
(Since a high voltage is applied to the Main Capacitor, take care not to receive electric shock or to shortcircuit other parts.)

Safety Precautions

(1) TS Mech safety
The laser beam is emitted in the TS Mech Recorder Ass'y.
If the laser beam gets in your eyes, it could cause eye damage, so never disassemble the TS Mech Recorder Ass'y.

(2) Precautions for handling TS Mech
This product's laser beam condenses light using an objective lens in the light pick up, so that it strikes a focal point on the disk's recording surface. Therefore, make sure that your eyes are at least 30 cm away from the objective lens when the laser diode is emitting light.

Note : In complete products, the laser beam is not normally emitted when the Disc Cover is open. The laser beam is emitted when the two open/closed detection sensors near the Disc Cover are set to closed or when the Disc Cover on a disassembled product is closed and the operation of the TS Mech Recorder Ass'y is being checked.

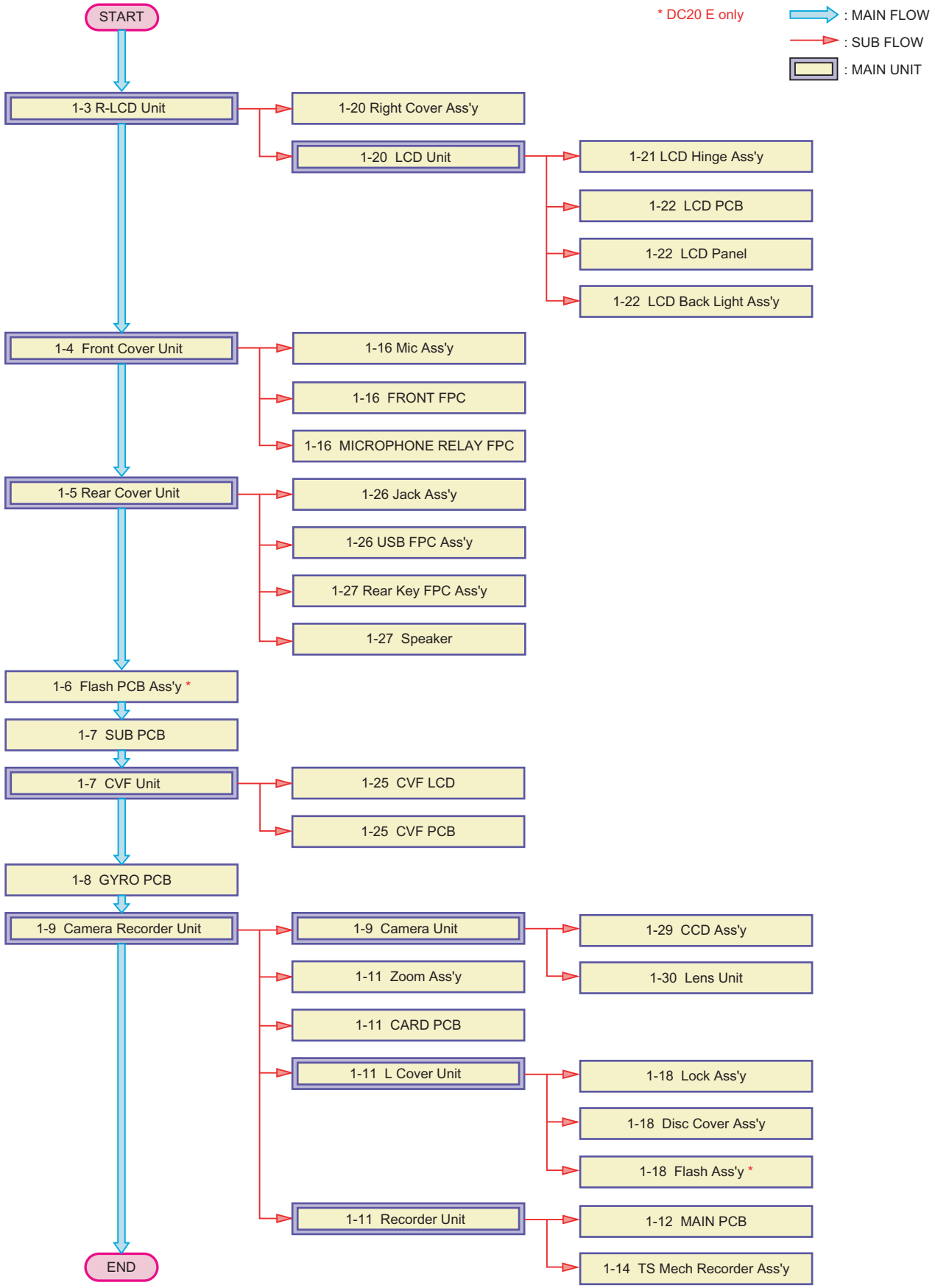
The laser diode wavelength of this product is from 652 to 662.5 nm, and the power consumption is below 1mW.

List of Supplies

Item Name	Item Number	Purpose	Remarks
Hanarl KS-39M	DY9-3053-000	Lubrication	Cover
Three Bond 1401B	CY9-8012-000	Adhesive	Screw
Sponge (W × H × T : 300mm × 200mm × 6mm)	DY9-4001-000	General-purpose vibration-isolating /sound-absorbing material	
Adhesive Tape, No.354E (W × L × T : 9mm × 50m × 0.15mm, UL type)	DY9-3032-000	General-purpose adhesive tape	
Adhesive Tape, No. 501F (W × L × T : 10mm × 50m × 0.16mm, UL type)	DY9-3034-000	General-purpose double-side-coated adhesive tape	
Kapton Tape (W × L × T : 9mm × 20m × 0.025mm)	DY9-3052-000	General-purpose adhesive tape	
Sheet, Shield (W × H : 250mm × 250mm)	DY9-3036-000	General-purpose shield material	

1-1 Disassembling / Reassembling Flowchart

(1) Find the replacement part on the chart, and disassemble it following the instruction on chart.
(2) Reassemble by reversing the disassembly procedures.



1-2 Separation of R Upper Cover

(1) Connect to the External Power Source, and open the Disc Cover.
Note1 : Never touch the Lens Section of TS Mech Recorder Ass'y.

(2) Insert a clip or the like into the part B from the inside of the camera, disengage two claws C, and then detach the Center Cover Lid.
Note2 : If the Disc Cover does not open because the fuse is blown or power is not supplied, break the Center Cover Lid to detach the R Upper Cover. When detaching it, be careful not to damage the surrounding covers.

(3) Remove two screws (s × 2). Remove five claws D, and detach the R Upper Cover.
Note3 : When detaching the R Upper Cover, take care not to deform the claws part.

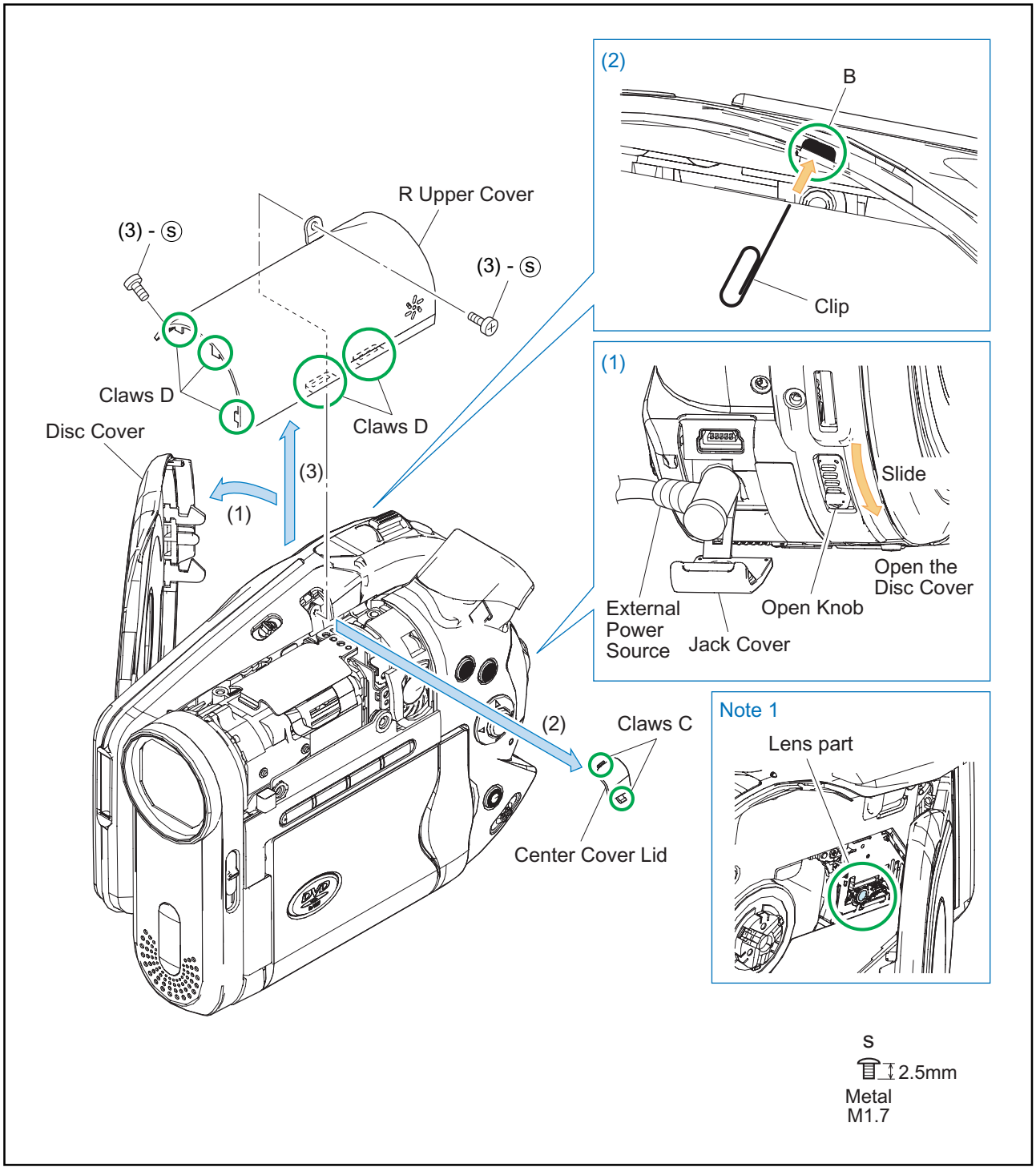


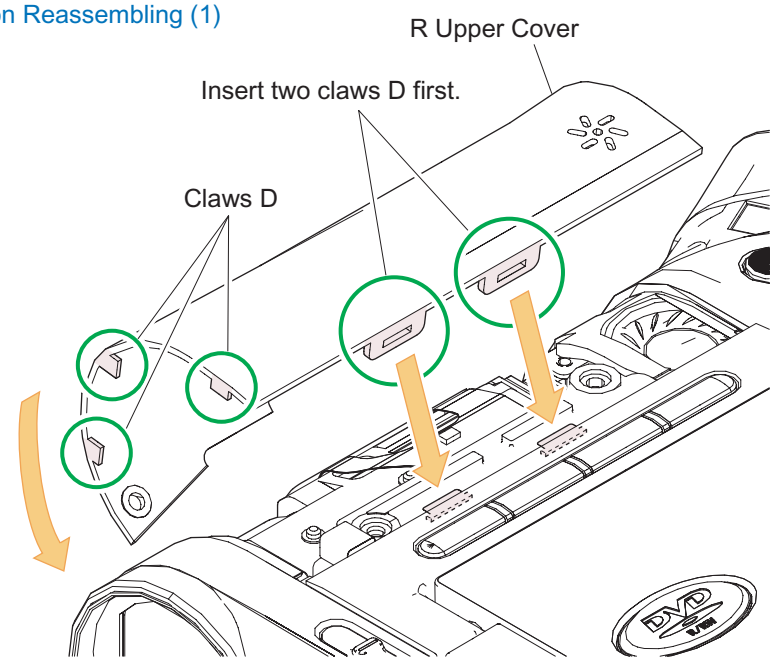
Fig. 1

<Note on Reassembling>

(1) Attach the R Upper Cover as shown in the figure below.

(2) Attach the Center Cover Lid as shown in the figure below.

Note on Reassembling (1)



Note on Reassembling (2)

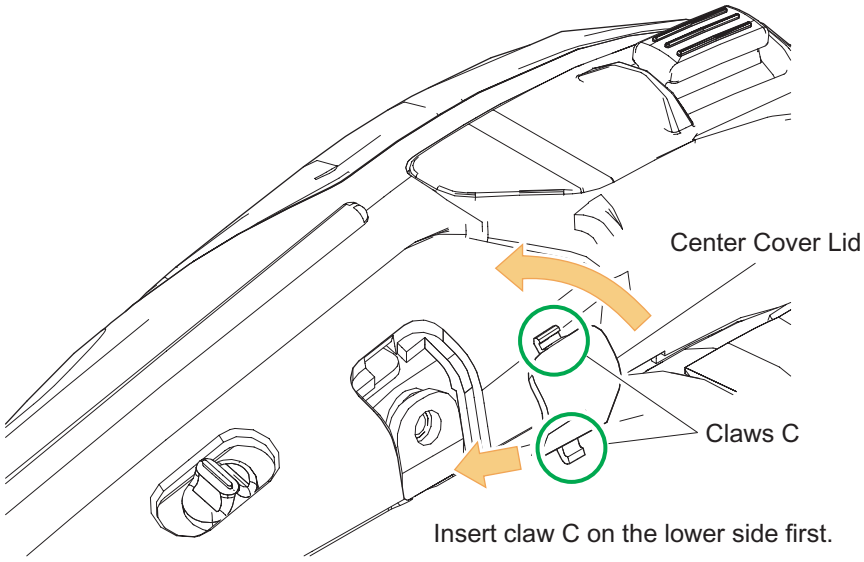


Fig. 2

1-3 Separation of R-LCD Unit

(1) Open the LCD, and remove eight screws (c × 1, s × 3, t × 4).

(2) Disconnect the CN104, the CN100 (B to B) , and the CN901, and detach the R-LCD Unit.

Note : Take care not to damage the flexible cable.

(3) Detach the Lid Bottom and the Bottom Radiative Rubber.

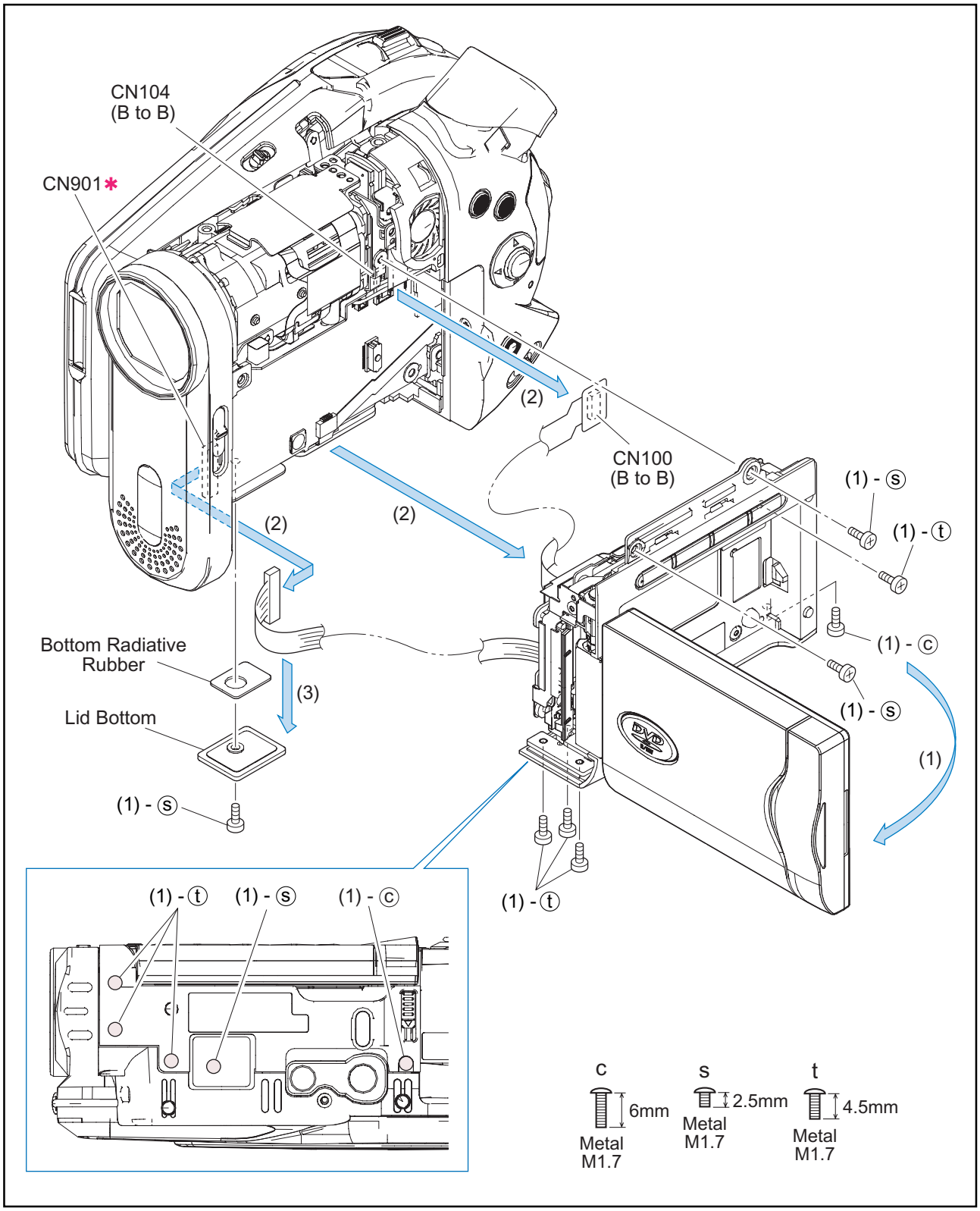


Fig. 3

<Note on Reassembling>

(1) Attach the R-LCD Unit as shown in the figure below.

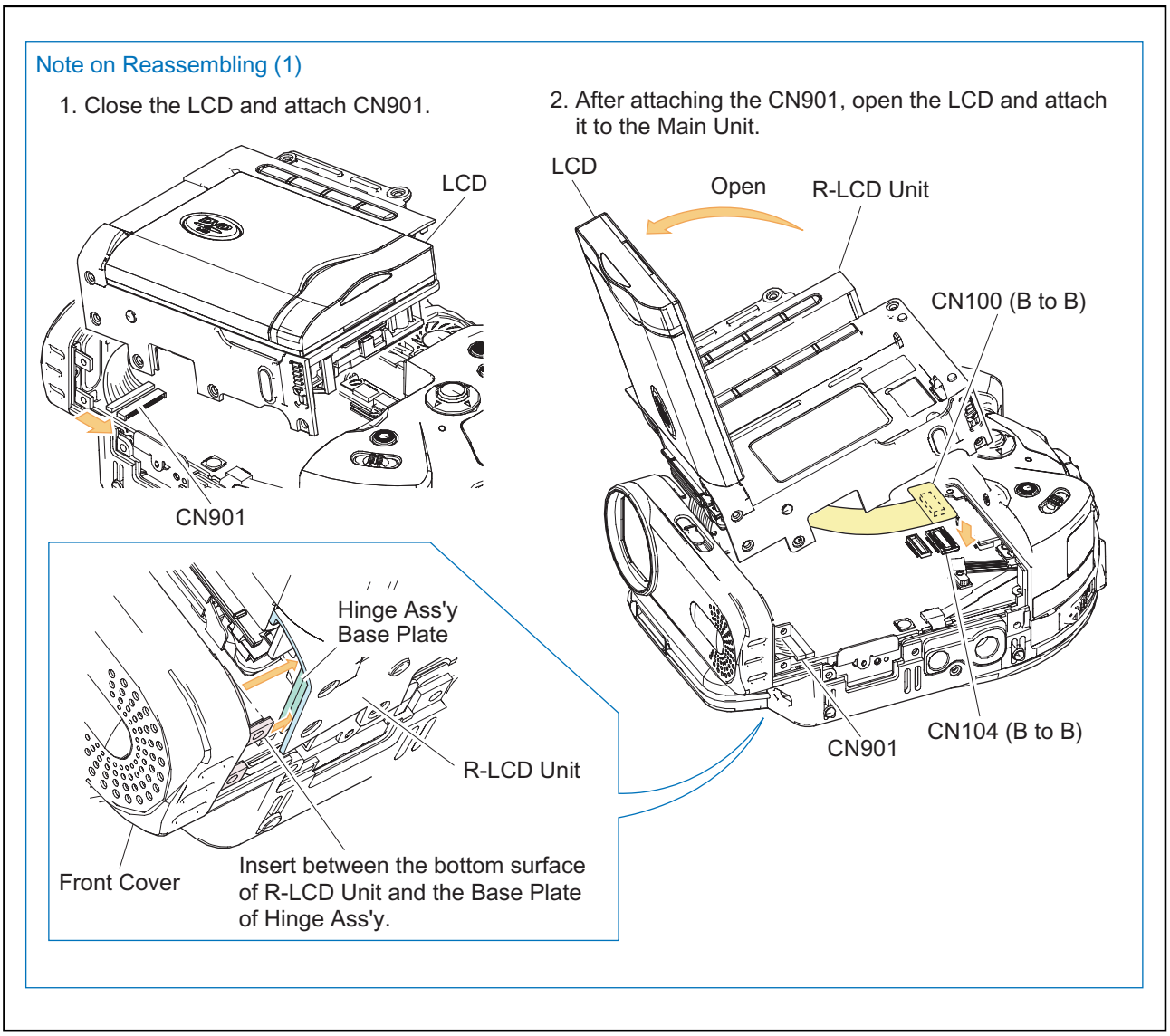

Note on Reassembling (1)
1. Close the LCD and attach CN901.
LCD
CN901
2. After attaching the CN901, open the LCD and attach it to the Main Unit.
LCD
Open
R-LCD Unit
CN100 (B to B)
CN104 (B to B)
CN901
Hinge Ass'y Base Plate
R-LCD Unit
Front Cover
Insert between the bottom surface of R-LCD Unit and the Base Plate of Hinge Ass'y.

Fig. 4

1-4 Separation of Front Cover Unit

(1) Remove two screws (a × 1, u × 1), and disconnect the CN106 and the CN701.
(2) Disengage two claws A, and detach the Front Cover Unit and the Front Sponge.
(3) Detach the Lens Ring.

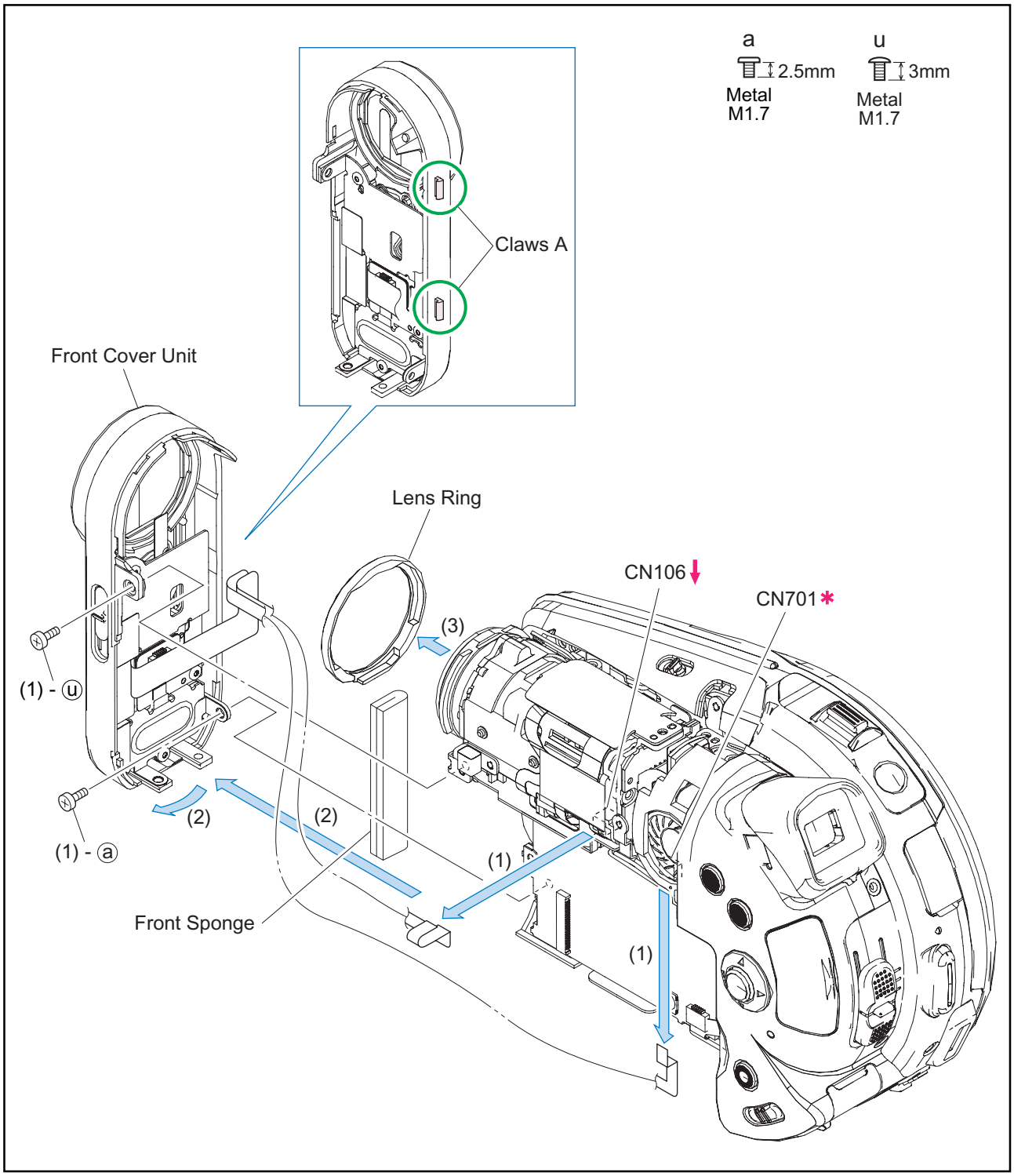


Fig. 5

<Note on Reassembling>

(1) Attach the Lens Ring as shown in the figure below.
(2) Attach the Front Cover Unit as shown in the figure below.
(3) Attach the Front Sponge as shown in the figure below.
(4) Treat the flexible part as shown in the figure below.

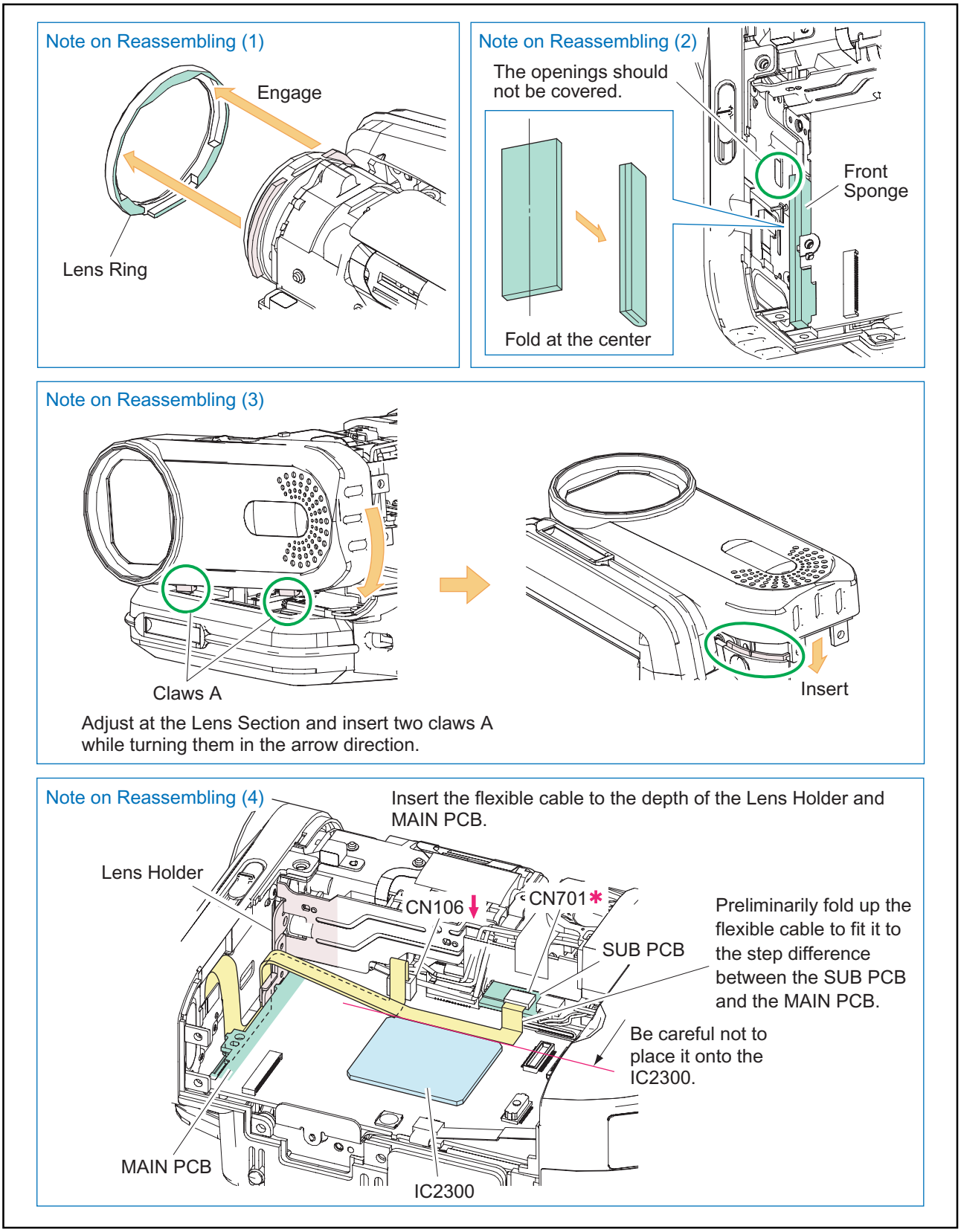

Note on Reassembling (1)
Engage
Lens Ring
Note on Reassembling (2)
The openings should not be covered.
Front Sponge
Fold at the center
Note on Reassembling (3)
Claws A
Insert
Adjust at the Lens Section and insert two claws A while turning them in the arrow direction.
Note on Reassembling (4)
Insert the flexible cable to the depth of the Lens Holder and MAIN PCB.
Lens Holder
CN106
CN701*
SUB PCB
Preliminarily fold up the flexible cable to fit it to the step difference between the SUB PCB and the MAIN PCB.
Be careful not to place it onto the IC2300.
MAIN PCB
IC2300

Fig. 6

1-5 Separation of Rear Cover Unit

(1) Open the SD Memory Cover, and remove four screws (v × 4).
(2) Remove the CN801 and the CN3501 to ensure that Rear Cover Unit is pulled up.
(3) Disconnect the CN108, the CN3200, and detach the Rear Cover Unit.

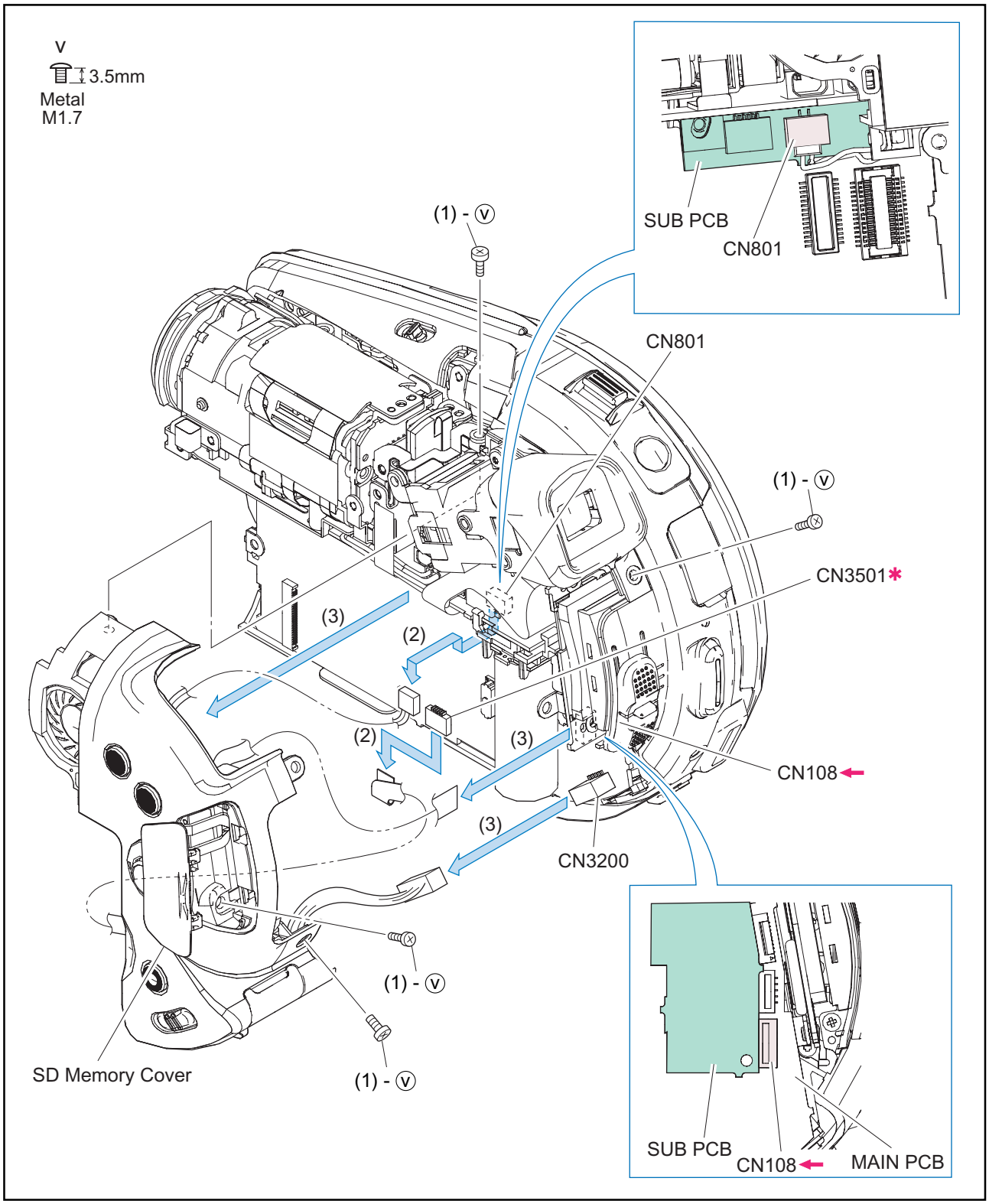


Fig. 7

<Note on Reassembling>

(1) Attach the Rear Cover Unit as shown in the figure below.

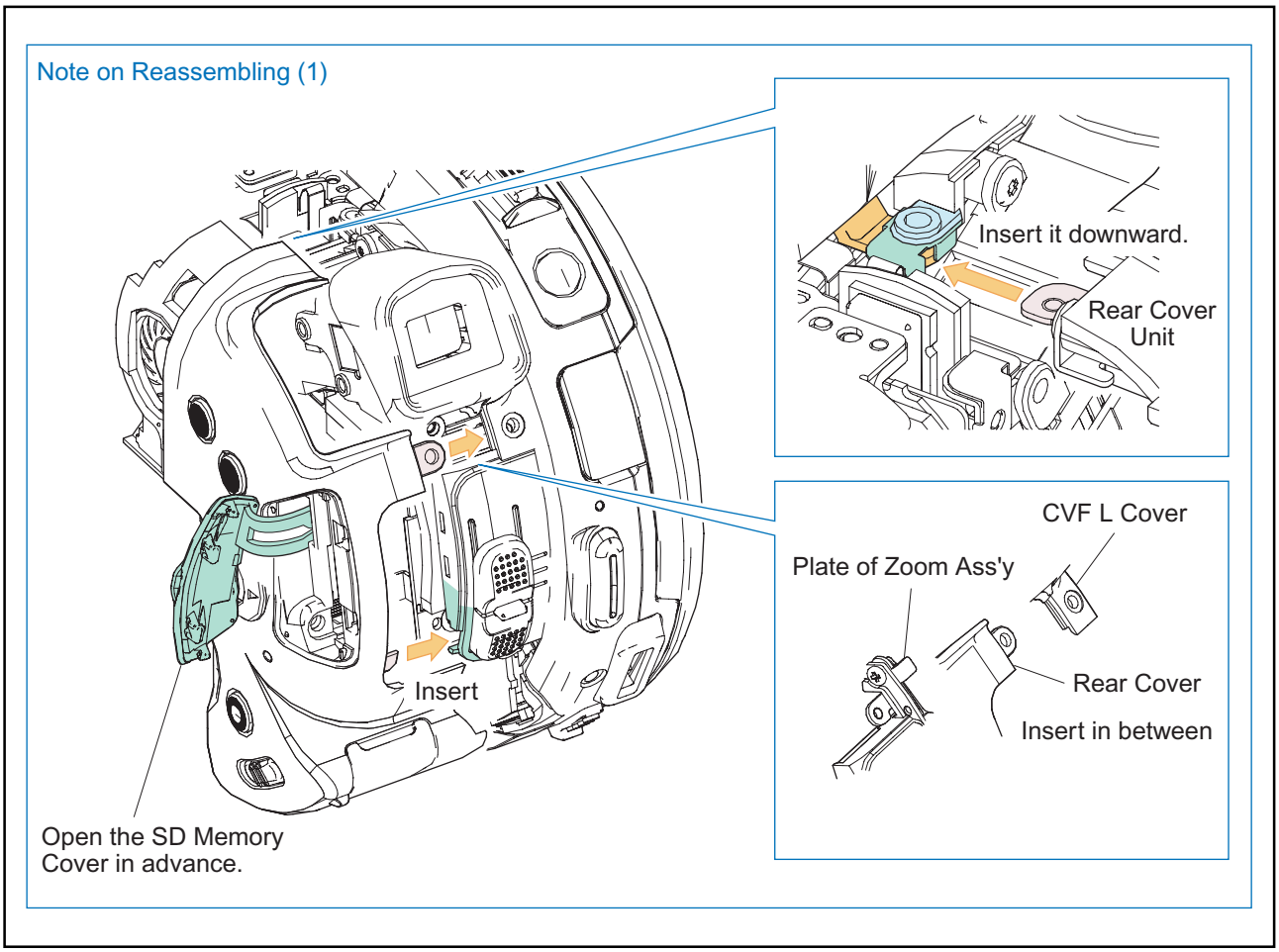


Fig. 8

1-6 Separation of Flash PCB ASS'Y (DC20 E only)

Note : After separating the Rear Cover Unit, be sure to discharge the Main Capacitor. (A high voltage is present on the circuit. Be careful not to receive electric shock or cause accidental contact with other parts.)

(1) Peel off the UL Tape. Remove two screws (a × 2), disconnect the CN500, the CN501, and the CN502, and then detach the Flash PCB Ass'y.

(2) Disengage three claws A and two claws B, and unsolder part α (two points) and part β (two points) , and detach the FLASH PCB, the Flash PCB Holder, the Capacitor PCB, the Main Capacitor, and the Condenser Wire.

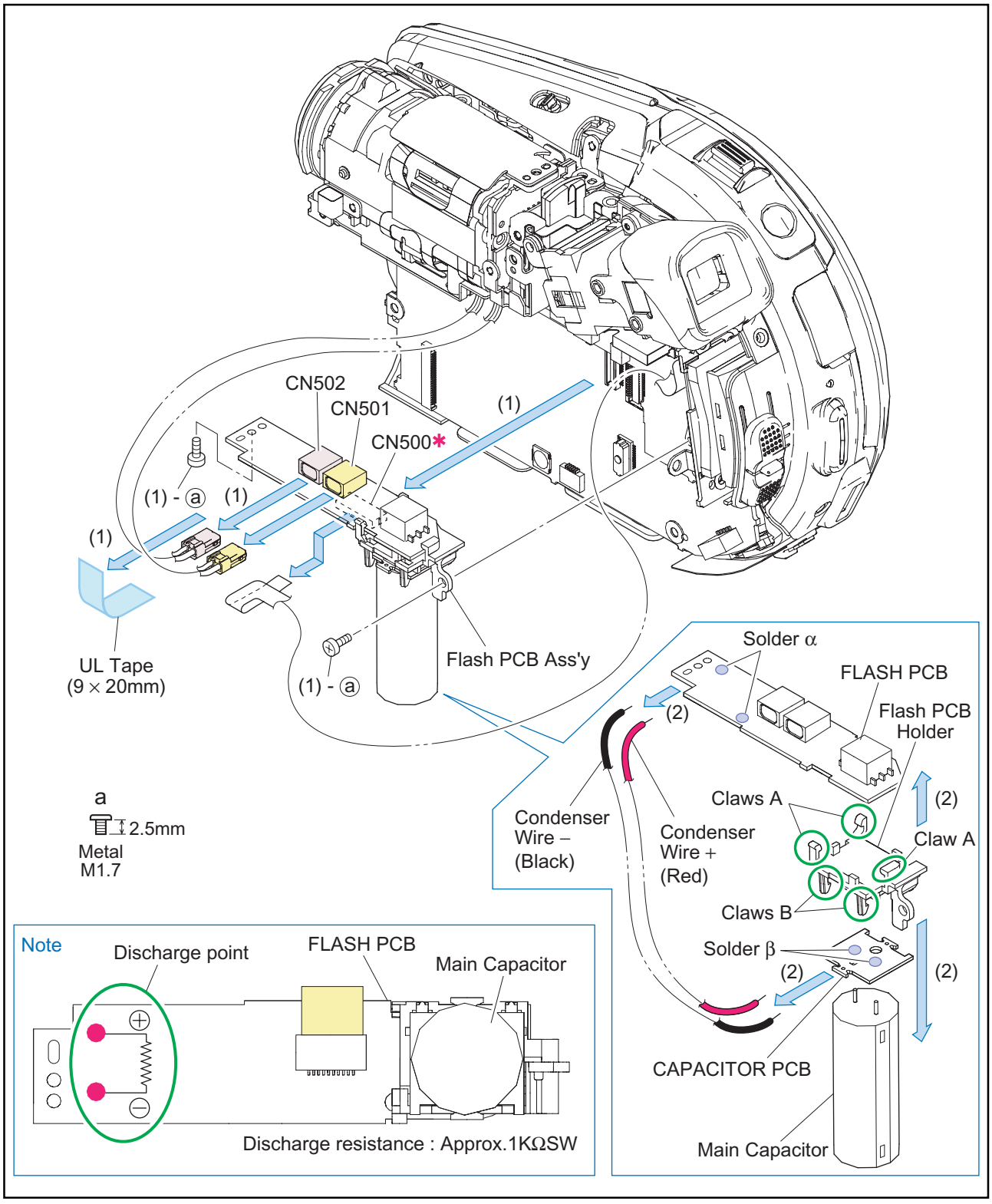


Fig. 9

<Note on Reassembling>

(1) Attach the Main Capacitor, the Condenser Wire, and the Flash PCB Holder as shown in the figure below.
(2) Attach the FLASH PCB and the Condenser Wire as shown in the figure below.
(3) Treat the Condenser Wire as shown in the figure below.
(4) Attach the Flash PCB Ass'y with its dowels aligned.
(5) Attach the FLASH FPC, the Condenser Wire, the Flash Cable, and the UL Tape as shown in the figure below.

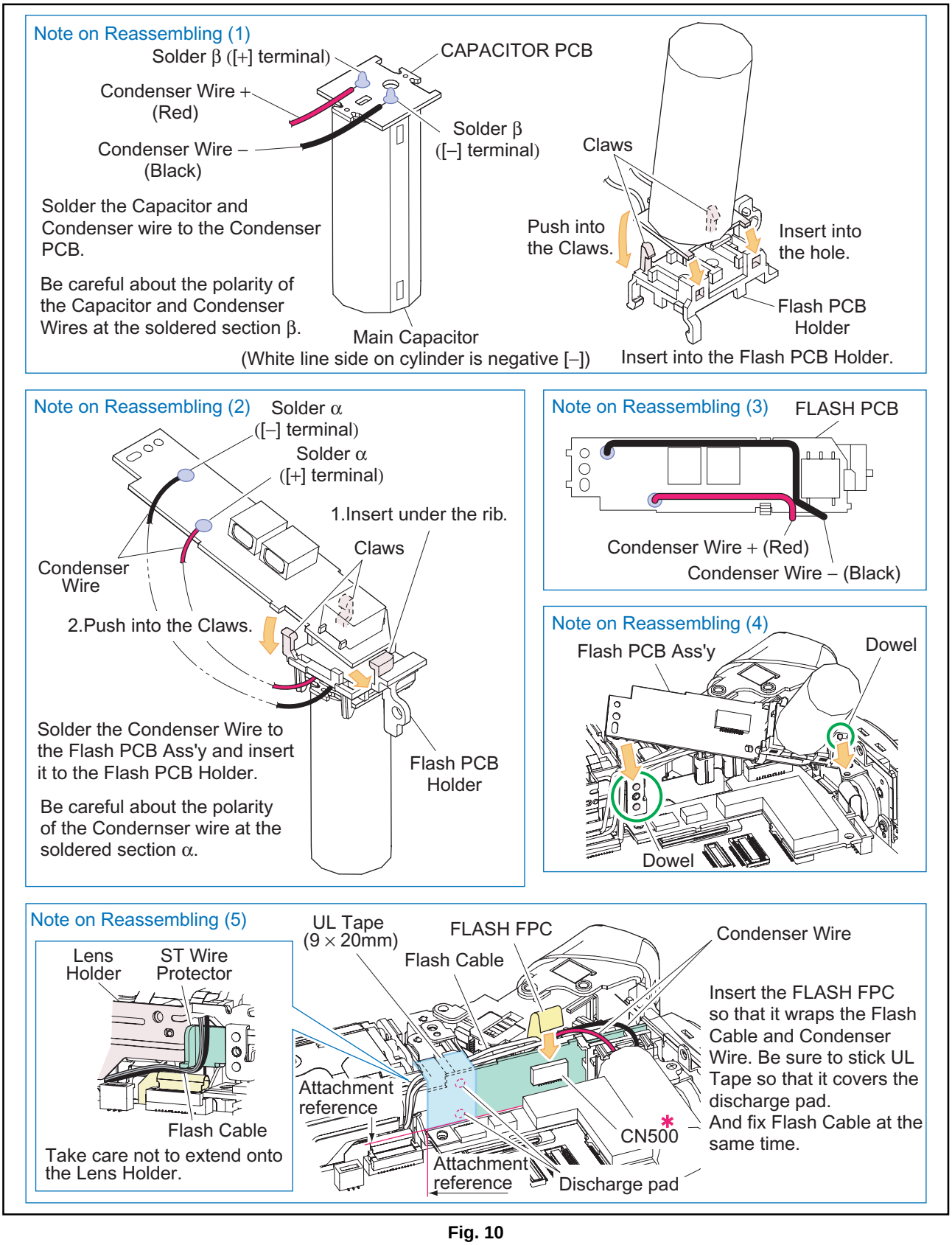

Note on Reassembling (1)
Solder β ([+] terminal)
CAPACITOR PCB
Condenser Wire + (Red)
Solder β ([–] terminal)
Condenser Wire – (Black)
Solder the Capacitor and Condenser wire to the Condenser PCB.
Be careful about the polarity of the Capacitor and Condenser Wires at the soldered section β.
Main Capacitor
(White line side on cylinder is negative [–])
Claws
Push into the Claws.
Insert into the hole.
Flash PCB Holder
Insert into the Flash PCB Holder.
Note on Reassembling (2)
Solder α ([–] terminal)
Solder α ([+] terminal)
1.Insert under the rib.
Claws
Condenser Wire
2.Push into the Claws.
Solder the Condenser Wire to the Flash PCB Ass'y and insert it to the Flash PCB Holder.
Be careful about the polarity of the Condernser wire at the soldered section α.
Flash PCB Holder
Note on Reassembling (3)
FLASH PCB
Condenser Wire + (Red)
Condenser Wire – (Black)
Note on Reassembling (4)
Flash PCB Ass'y
Dowel
Dowel
Note on Reassembling (5)
Lens Holder
ST Wire Protector
Flash Cable
Take care not to extend onto the Lens Holder.
UL Tape (9 × 20mm)
FLASH FPC
Flash Cable
Condenser Wire
Insert the FLASH FPC so that it wraps the Flash Cable and Condenser Wire. Be sure to stick UL Tape so that it covers the discharge pad.
And fix Flash Cable at the same time.
Attachment reference
CN500 *
Attachment reference
Discharge pad

Fig. 10

1-7 Separation of CVF Unit, SUB PCB

(1) Remove one screw (a × 1), disconnect the CN1501, and demount the CVF Unit.
(2) Remove one screw (a × 1), disconnect the CN2901 and the CN2905 (B to B), and detach the SUB PCB.
(3) Detach the SUB PCB Form.

<Note on Reassembling>

(1) Attach the SUB PCB Form to the position indicated in the figure below.

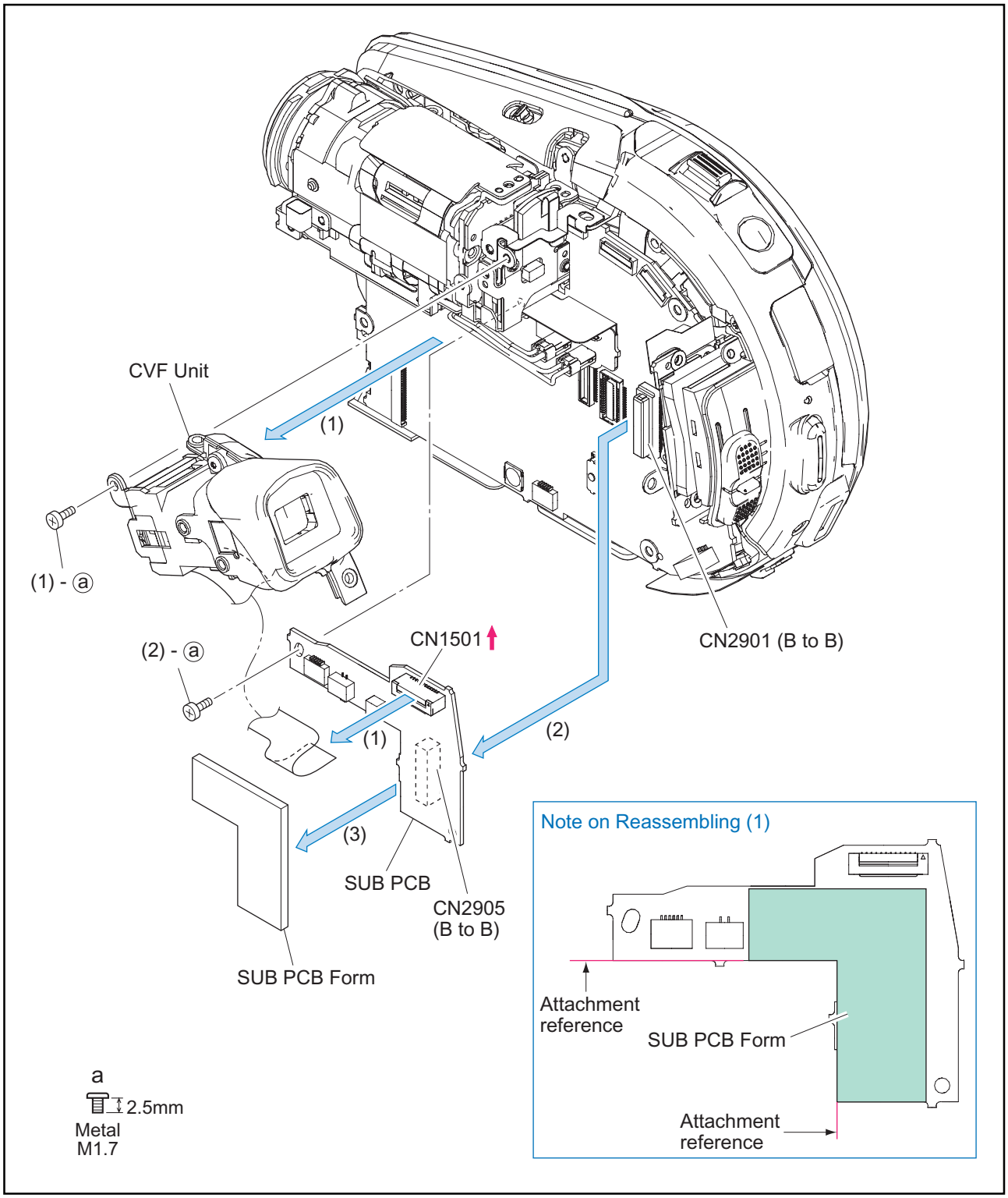


Fig. 11

1-8 Separation of GYRO PCB

(1) Remove one screw (a × 1), and detach the GYRO GND Plate.
(2) Remove two screws (a × 2), disconnect the CN1601, and detach the GYRO PCB Section.
(3) Remove two screws (a × 2), and detach the GYRO PCB.
(4) Detach the CCD Connector Sheet from the GYRO Holder.

<Note on Reassembling>

(1) Attach the CCD Connector Sheet as shown in the figure below.
(2) Attach the GYRO PCB Section as shown in the figure below.

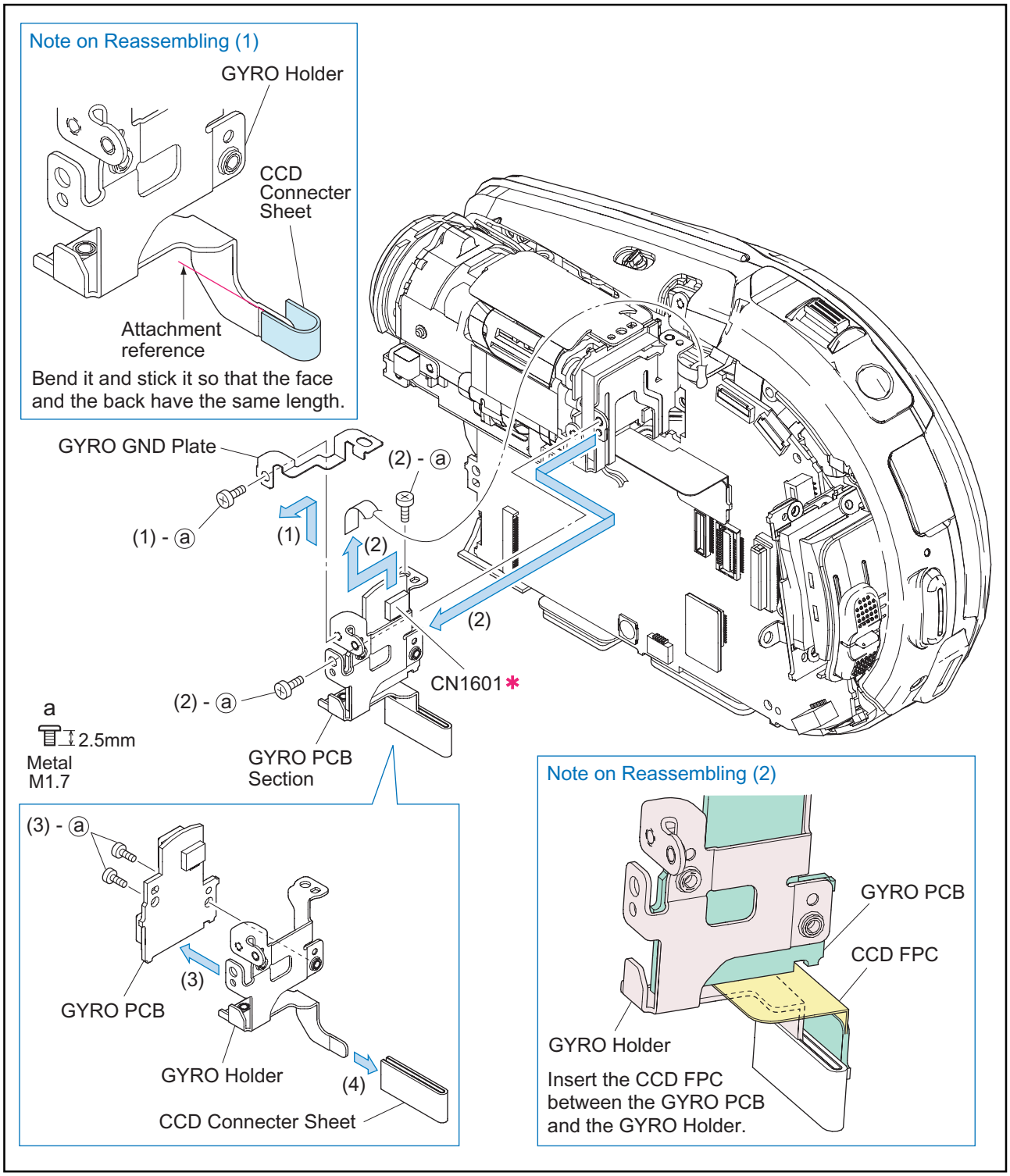


Fig. 12

1-9 Separation of Camera Unit

(1) Remove the CN1000 and the CN1052 (CN1070 for DC10 E) (B to B), the CN1200, and two screws (a × 2) , and detach the Lens Unit.

Note : Take care not to deform the CCD GND Plate.

<Note on Reassembling>

(1) Treat the Lens FPC and the Flash Cable as shown in the figure below.

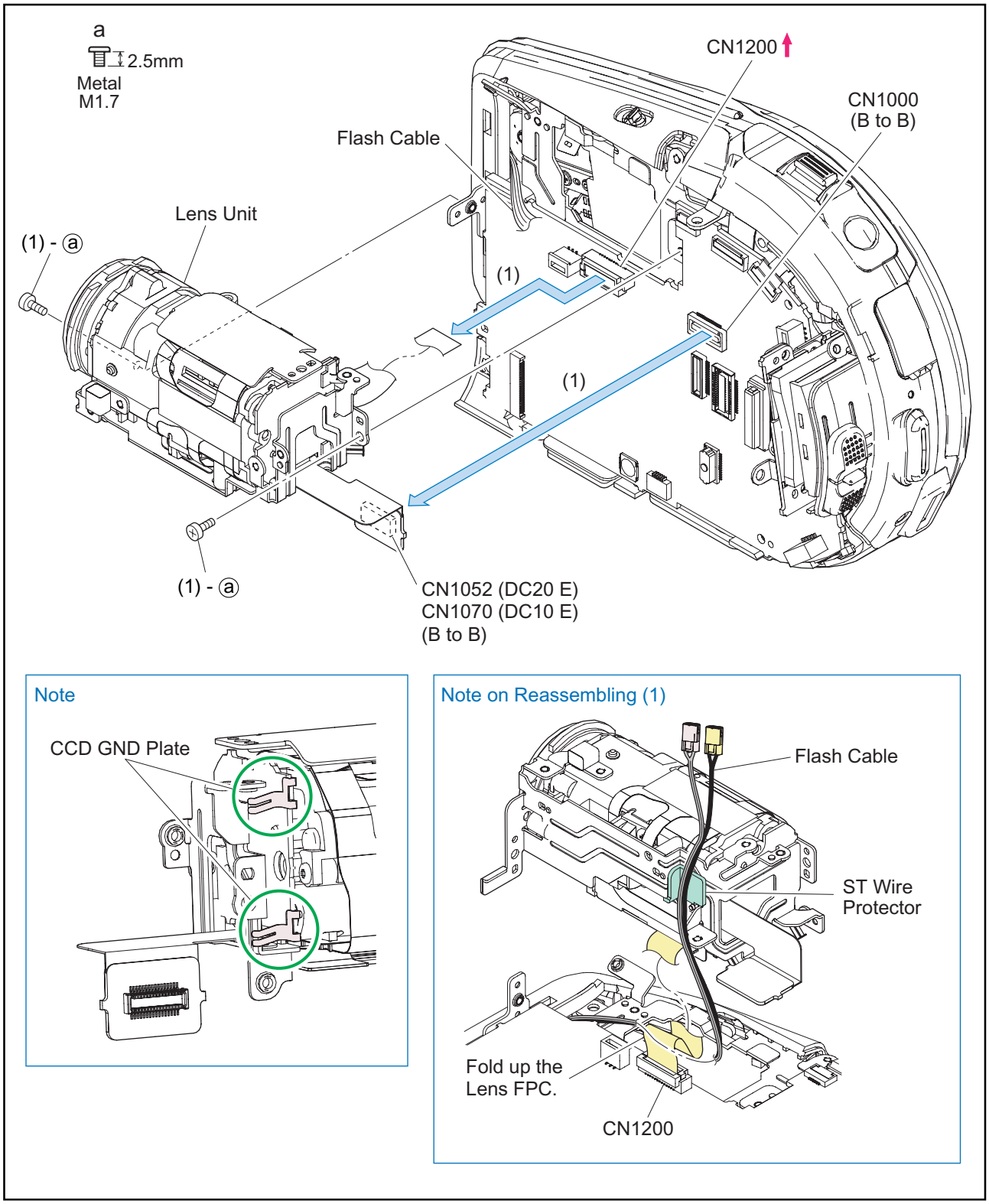


Fig. 13

1-10 Separation of Center Cover

(1) Open the Multi Jack Cover, and remove three screws (t × 1, u × 2).

(2) Remove three claws (five claws for DC10 E) , and detach the Center Cover, the Mode Switch, the Start/Stop Button, and the Multi Jack Cover.

Note : When detaching the Center Cover, take care not to damage the claws part.

(3) Detach the LED window, the Grip Belt Pin, and the Rear Grip Belt from the Center Cover.

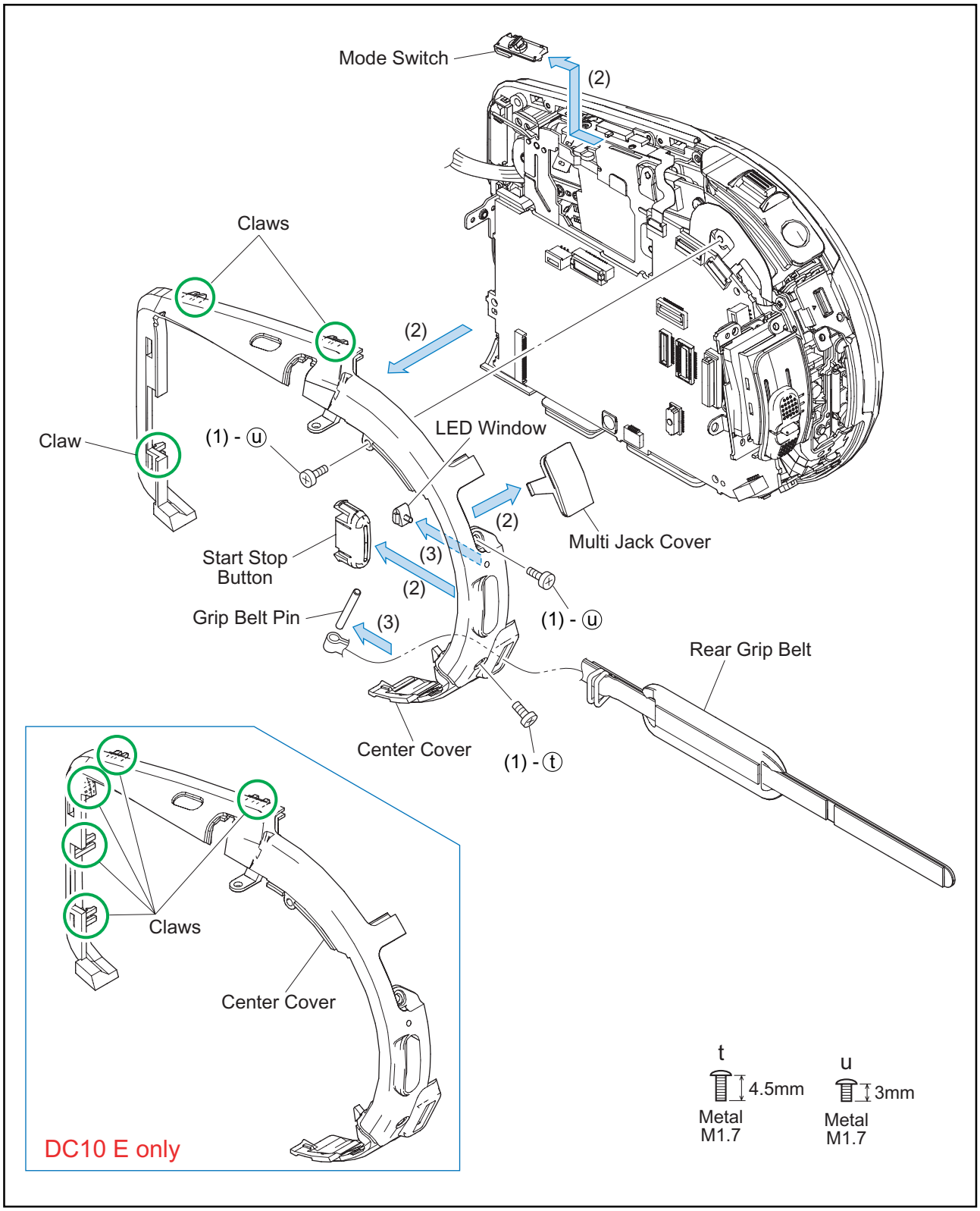


Fig. 14

<Note on Reassembling>

(1) Attach the Mode Switch as shown in the figure below.
(2) Attach the Center Cover as shown in the figure below.
(3) Insert the Multi Jack Cover after installing the Center Cover.
(4) Do not attach the Start/Stop Button at this time point.

Note : As long as the Start/Stop Button is not attached, the Disc Cover can be opened manually. Thus attach the Start/Stop Button after all component parts are assembled.

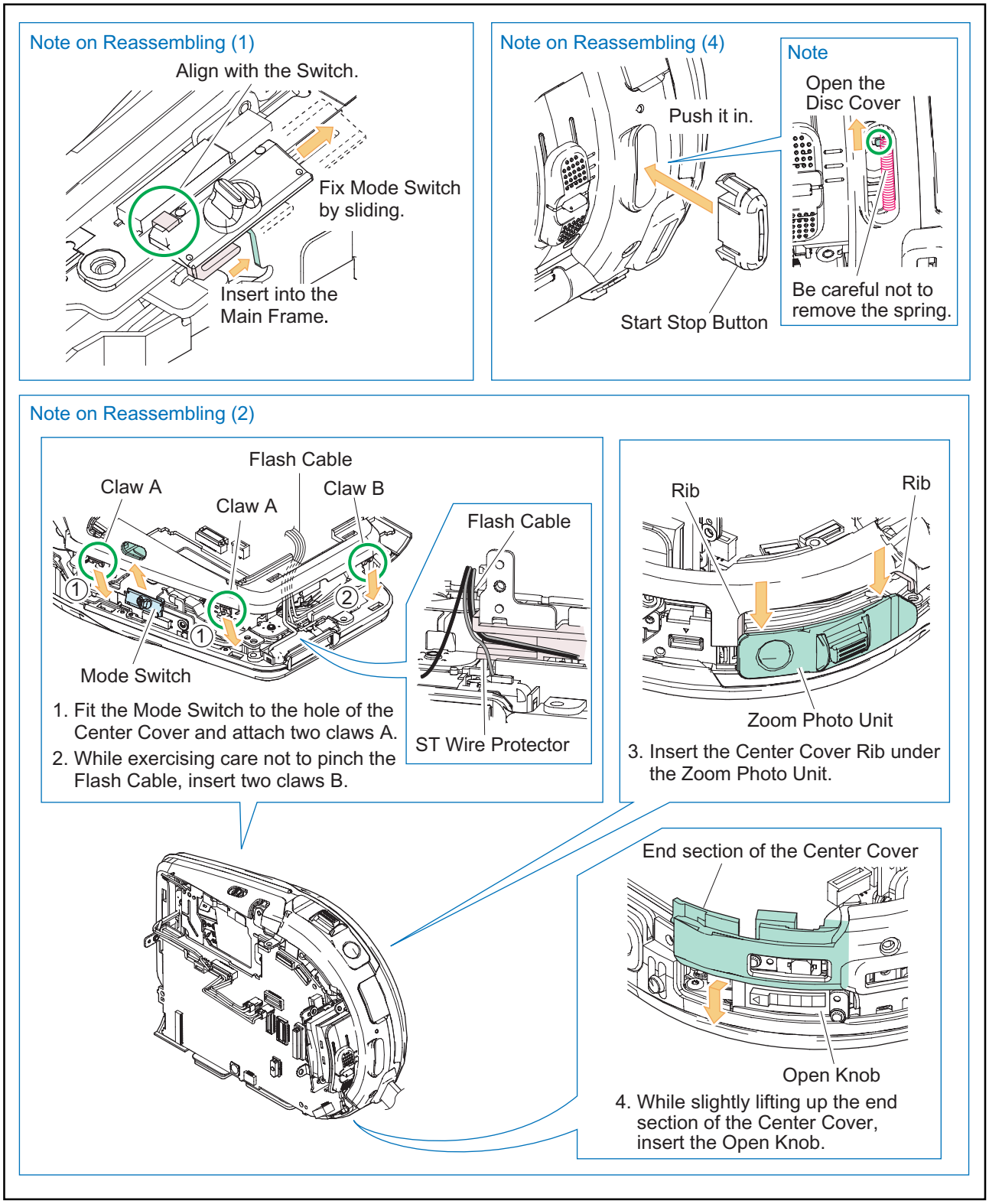

Note on Reassembling (1)
Align with the Switch.
Fix Mode Switch by sliding.
Insert into the Main Frame.
Note on Reassembling (4)
Push it in.
Start Stop Button
Note
Open the Disc Cover
Be careful not to remove the spring.
Note on Reassembling (2)
Flash Cable
Claw A
Claw A
Claw B
Mode Switch
1. Fit the Mode Switch to the hole of the Center Cover and attach two claws A.
2. While exercising care not to pinch the Flash Cable, insert two claws B.
Flash Cable
ST Wire Protector
Rib
Rib
Zoom Photo Unit
3. Insert the Center Cover Rib under the Zoom Photo Unit.
End section of the Center Cover
Open Knob
4. While slightly lifting up the end section of the Center Cover, insert the Open Knob.

Fig. 15

1-11 Separation of Zoom Ass'y, CARD PCB

(1) Open the Disc Cover.
(2) Remove two screws (f × 1, g × 1) , disconnect the CN100, and detach the Zoom Ass'y.
(3) Remove two screws (a × 2) , disconnect the CN50 and CN105, and detach the CARD PCB and the CARD FPC.
(4) Remove solder (α) from the CARD PCB, and detach the LI Battery.

<Note on Reassembling>

(1) Mount the CARD FPC in the orientation indicated in the figure below.

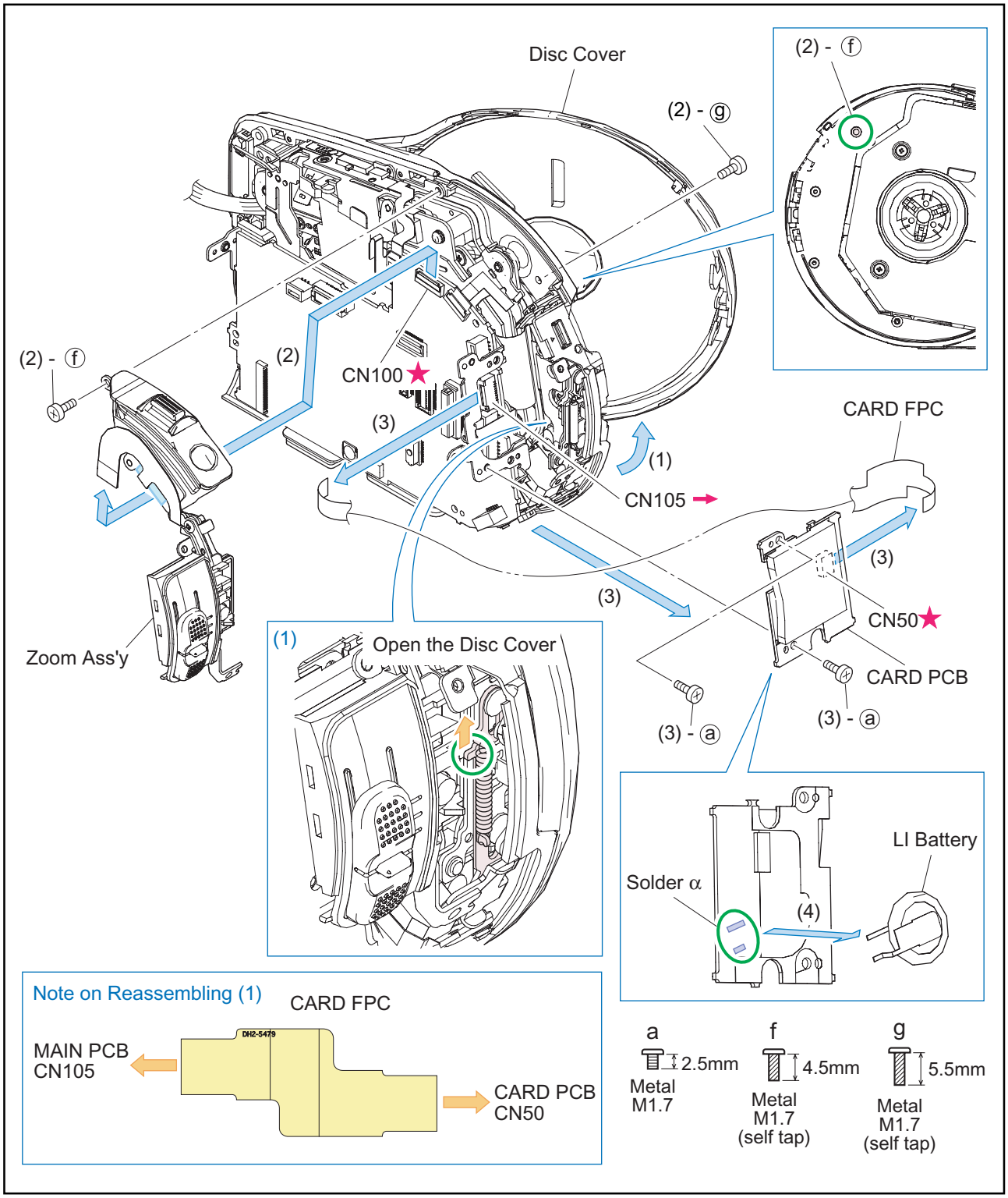


Fig. 16

1-12 Separation of MAIN PCB

(1) Detach the UL Tape. Remove three screws (a × 3), disconnect the CN102, the CN107, the CN2100, and the CN2300, and detach the MAIN PCB.

(2) Detach the GYRO FPC, the FLASH FPC, and the Main Spacer from the MAIN PCB.

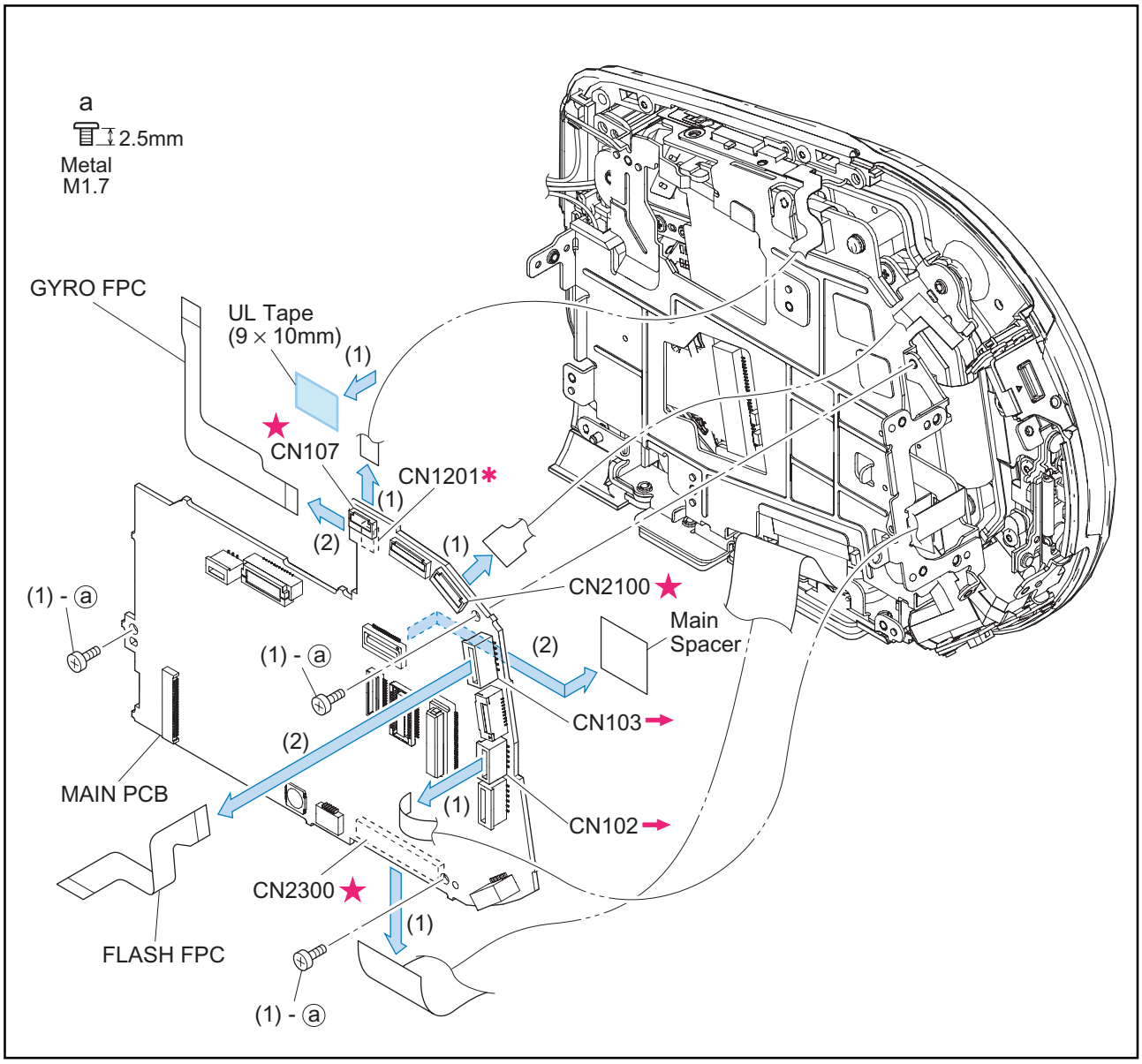


Fig. 17

<Note on Reassembling>

(1) Attach the Main Spacer to the position indicated in the figure below.

(2) Ensure that the GYRO FPC and the FLASH FPC are installed in the direction shown in the figure.

(3) Attach the UL Tape to the position indicated in the figure below.

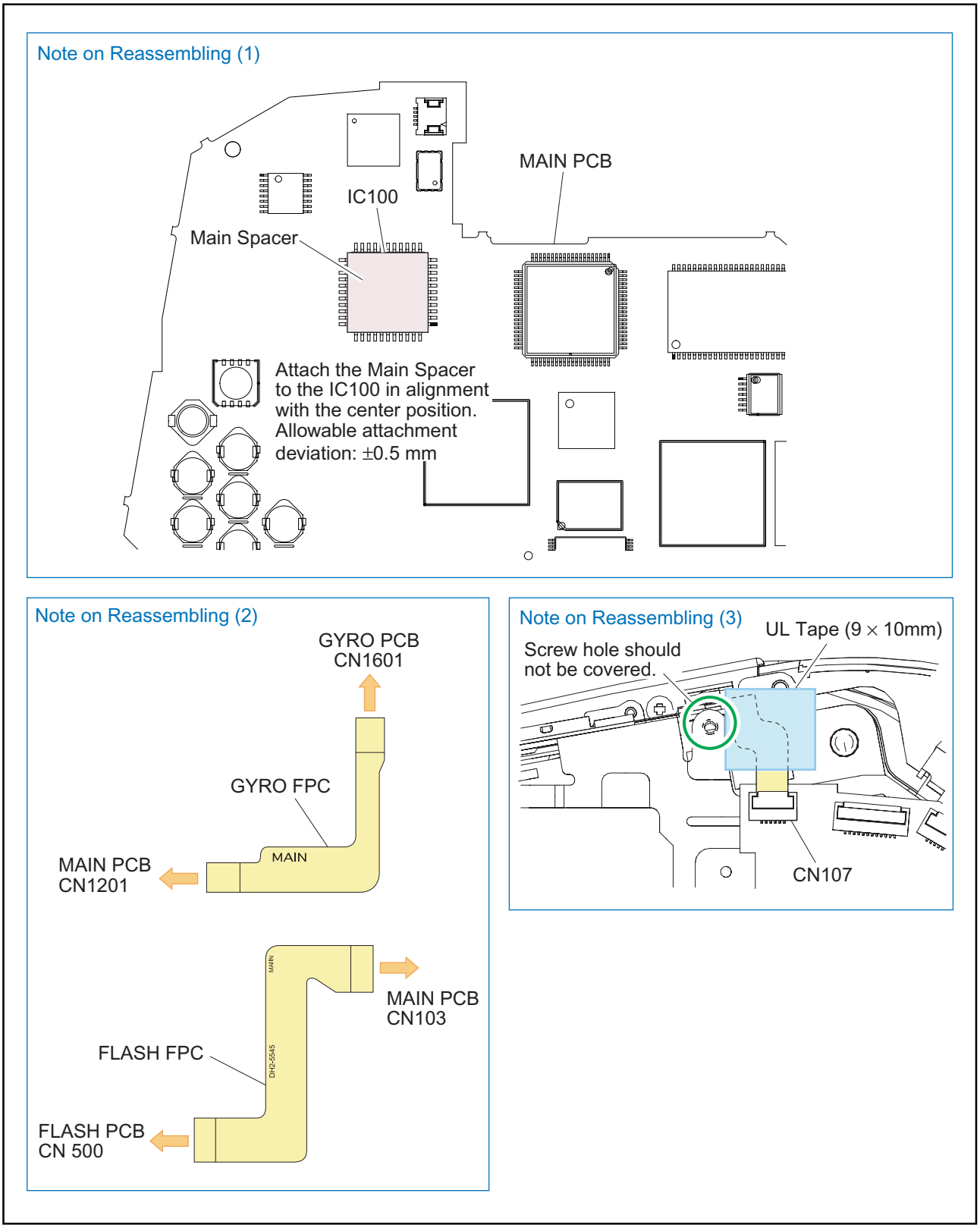


Fig. 18

1-13 Separation of TS Mech Section

(1) Open the Disc Cover.

(2) Remove four screws (b × 1, c × 1, f × 1, g × 1), and detach the TS Mech Section, the Tripod Base, and the Gap Sheet.

Note : After detaching the TS Mech Section, place it with its Lens part upward. Never touch the Lens part.

<Note on Reassembling>

(1) Attach the TS Mech Section as shown in the figure below.

(2) Attach the Gap Sheet to the position indicated in the figure below. (DC10 E only)

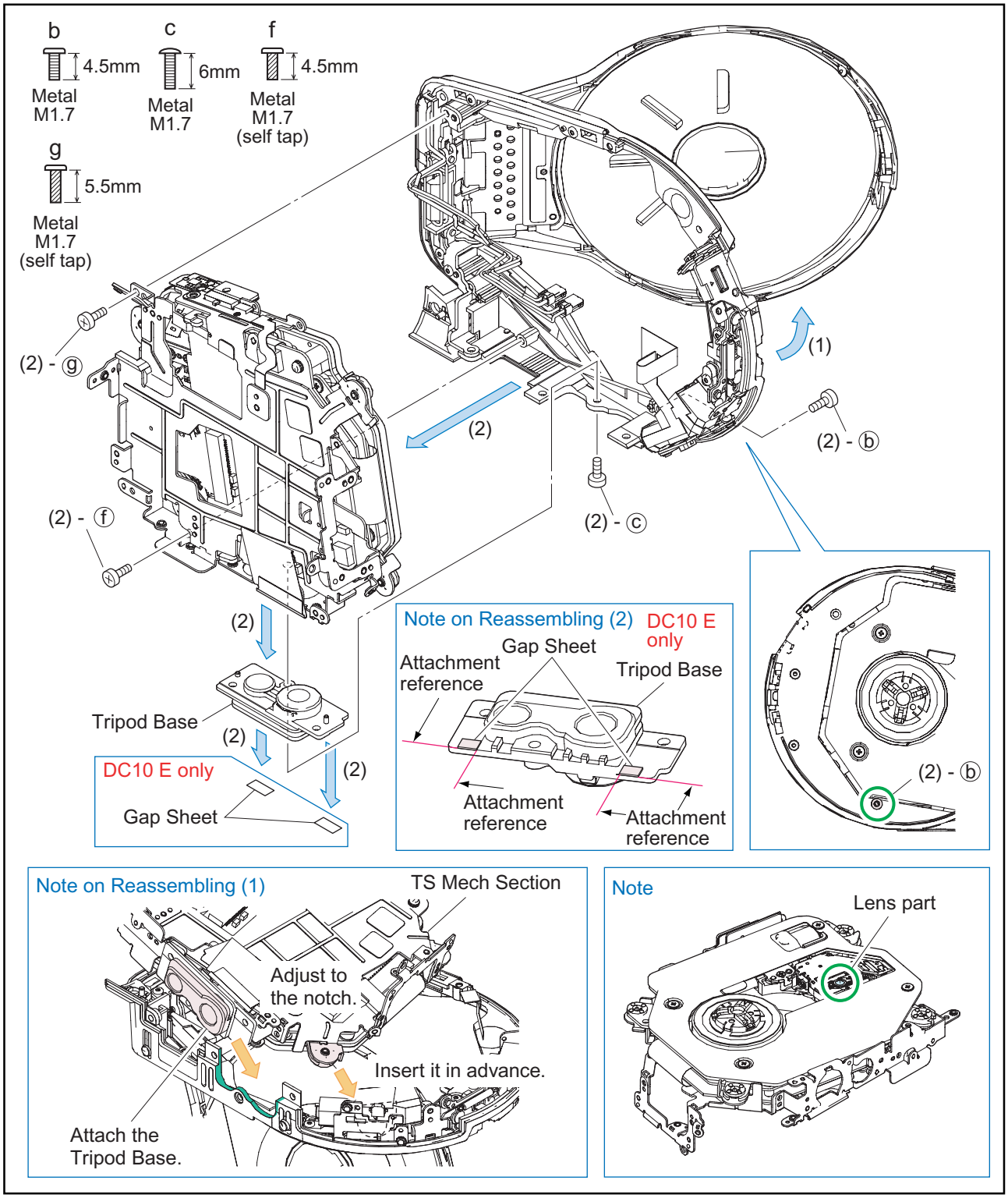


Fig. 19

1-14 Separation of Main Frame

Note : After detaching the TS Mech Section, place it with its Lens part upward. Never touch the Lens part. When cleaning the cover surface part, wipe it with a dry clock without using a solvent for protection of the coating.

(1) Remove four screws (a × 4), and detach the Bottom Frame and the Card Holder.

(2) Remove five screws (a × 1, h × 4), and detach the Chassis Damper, the Main Frame, and the AE FPC Ass'y.

(3) Detach the Gasket and the ST Wire Protector (DC20 E only).

(4) Disconnect the CN201, and detach the MAIN FPC, the FE FPC Shield, the Shield Sheet, and the D Cover Supporter.

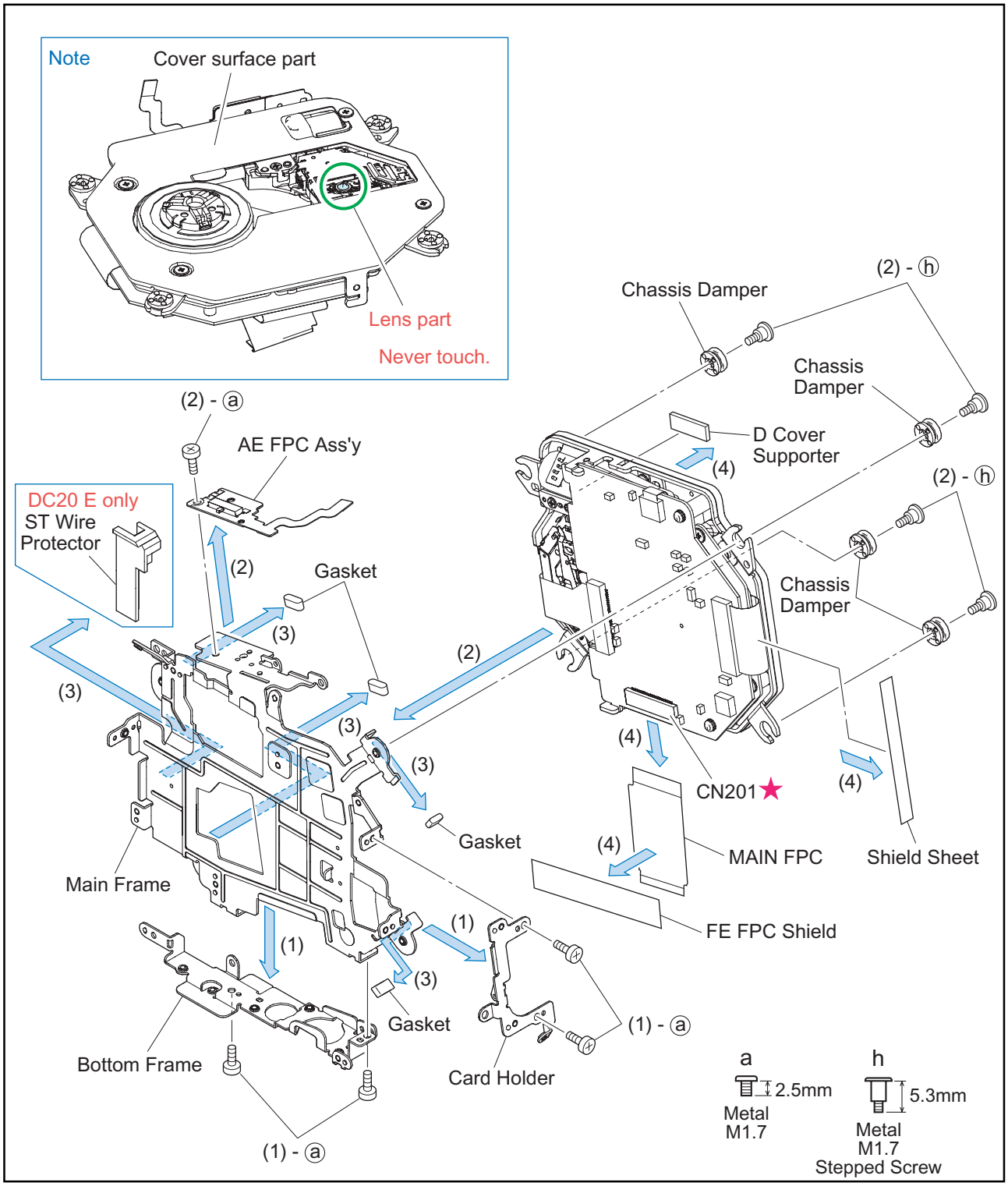


Fig. 20

<Note on Reassembling>

(1) Mount the MAIN FPC in the orientation indicated in the figure below. And Attach the FE FPC Shield to the position indicated in the figure below.

(2) Attach the D Cover Supporter to the position indicated in the figure below.

(3) Attach the Shield Sheet as shown in the figure below.

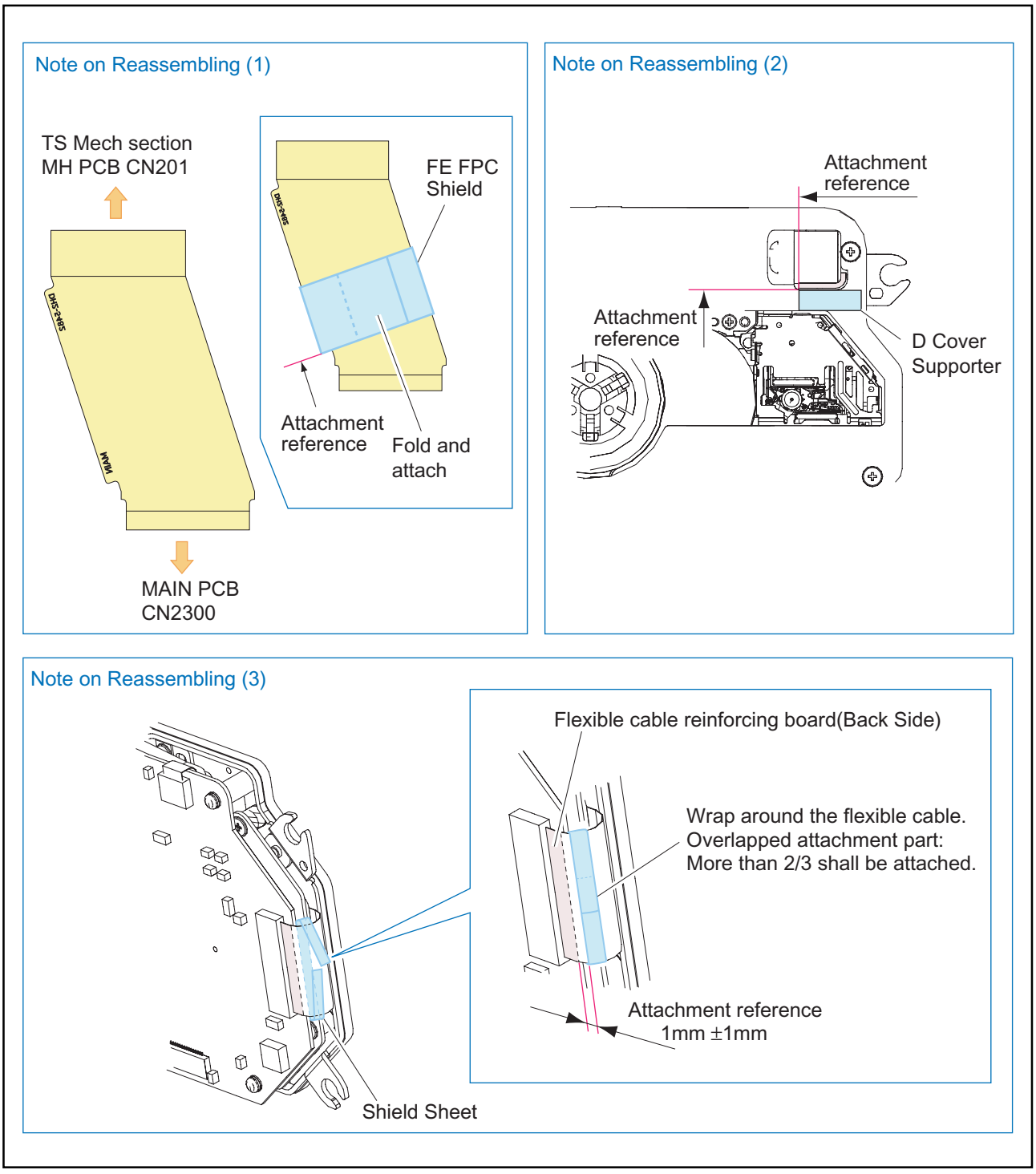
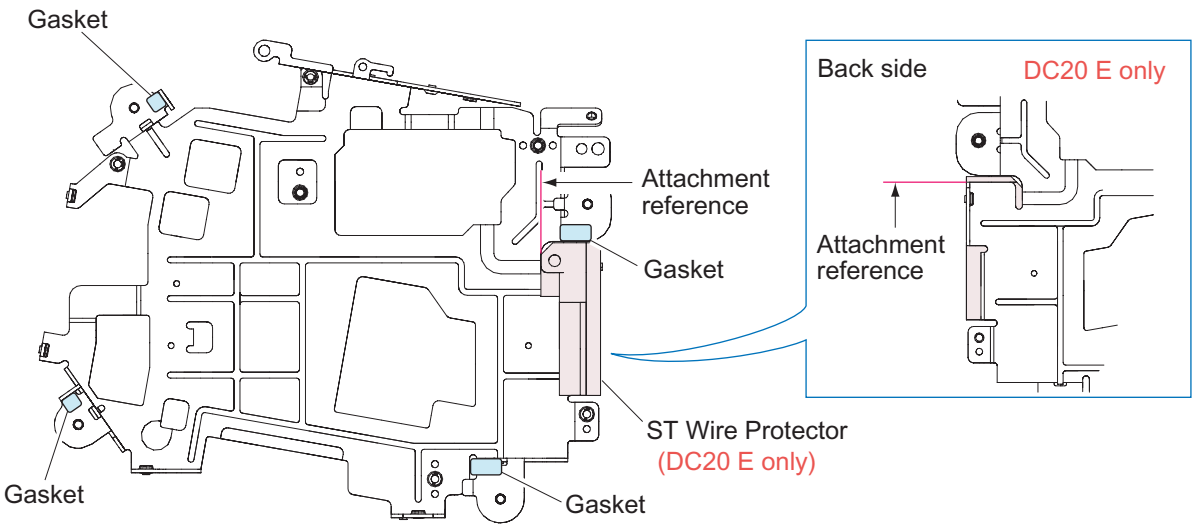


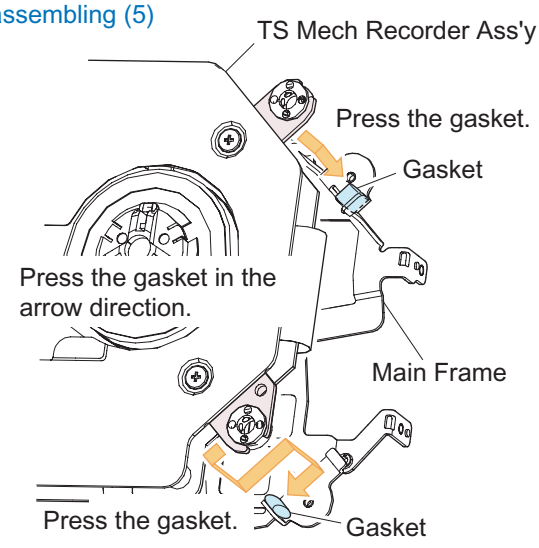
Fig. 21

(4) Attach the Gasket and the ST Wire Protector (DC20 E only) to the position indicated in the figure below.
(5) Attach the Main Frame as shown in the figure below.
(6) Do not reuse the step screws (h × 4) securing the Main Frame, because its tip is applied with adhesive for the prevention of loosening.

Note on Reassembling (4)



Note on Reassembling (5)



Ensure that the four gaskets are securely pinched between the TS Mech Recorder Ass'y Frame and the Main Frame.

Place the TS Mech Recorder Ass'y on the two gaskets other than the one shown above, and pinch them between.

Fig. 22

1-15 Disassembly of Front Cover Unit - 1

(1) Detach the Blindfold Sheet.

(2) Remove five screws (i × 4, j × 1), and detach the GND Plate, the Back Barrier Plate section, and the GND Plate Spring.

Note : Take care not to deform the GND Plate Spring.

(3) Detach the Barrier Slide Holder, the Barrier Knob, and the LED Radiator Gum (DC20 E only).

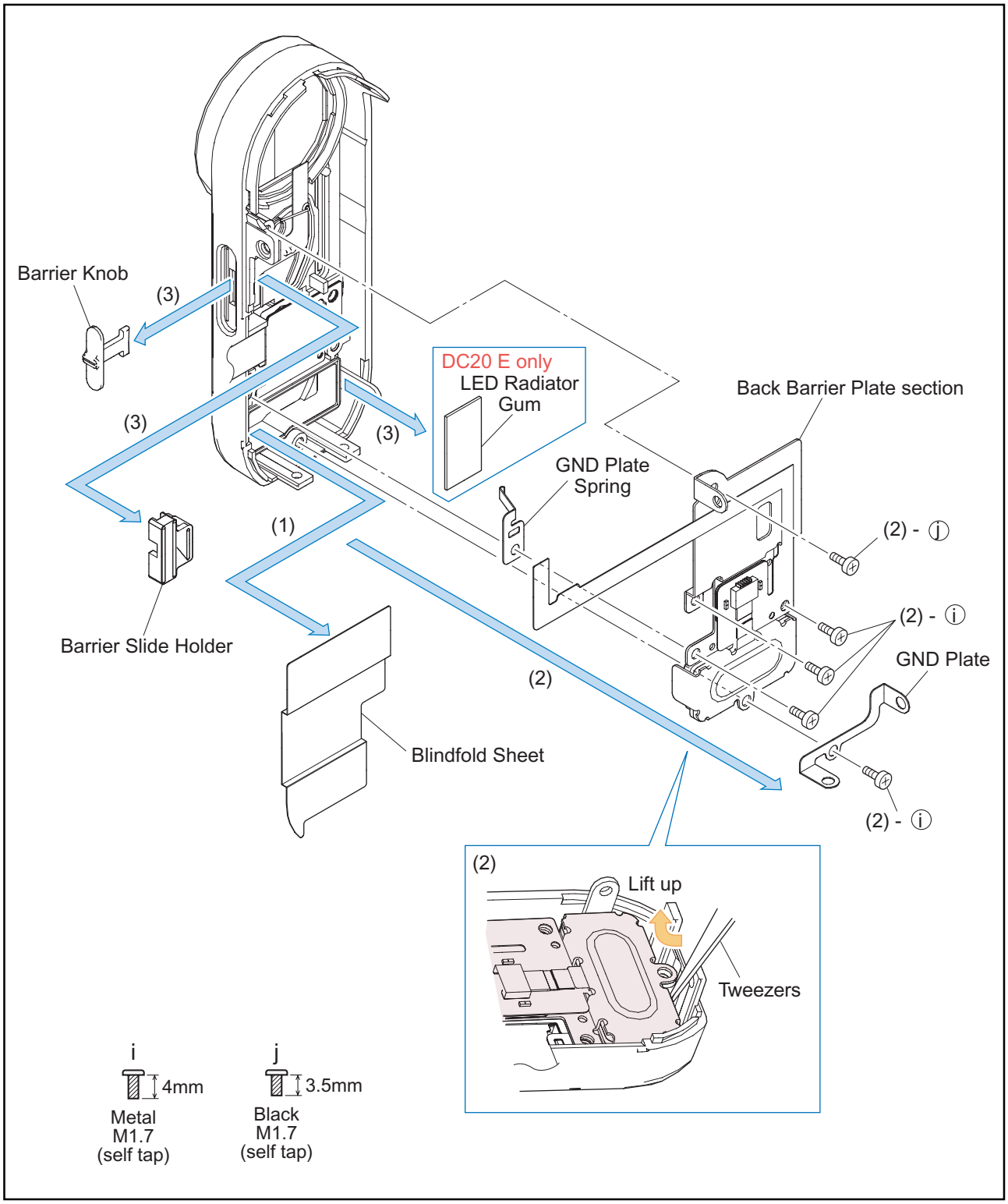
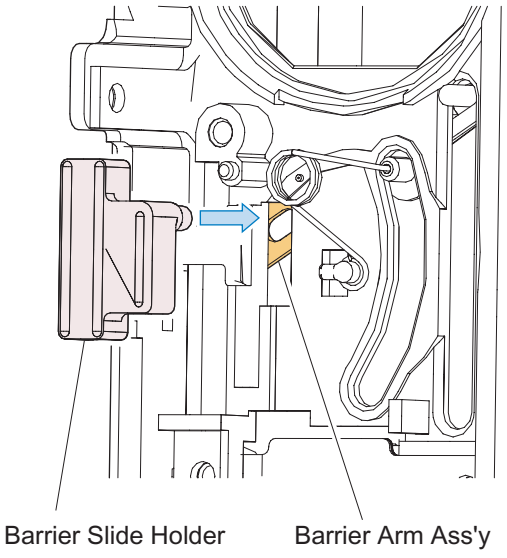


Fig. 23

<Note on Reassembling>

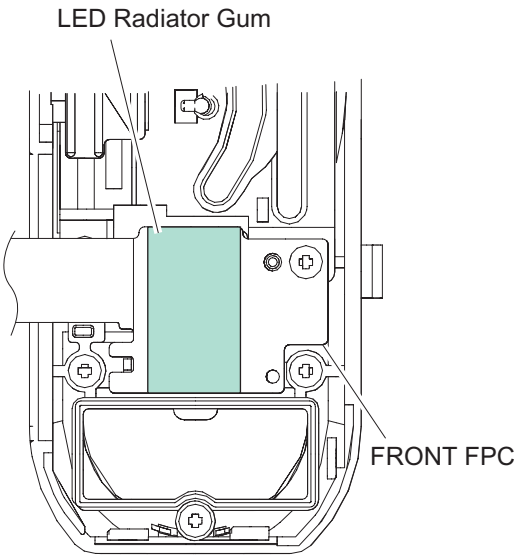
(1) Attach the Barrier Slide Holder as shown in the figure below.
(2) Attach the LED Radiator Gum to the position indicated in the figure below. (DC20 E only)
(3) The Back Barrier Plate should be mounted as shown in the figure. After mounting it, slide the Barrier Slide Holder to check if the Barrier opens/closes smoothly.
(4) Attach the Blindfold Sheet to the position indicated in the figure below.

Note on Reassembling (1)



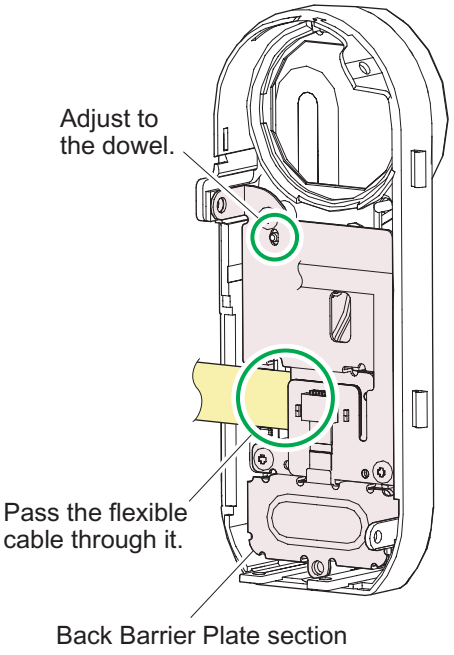
Mount the Barrier Slide Holder with its convex section inserted to the Barrier Arm Ass'y hole.

Note on Reassembling (2)



DC20 E only

Note on Reassembling (3)



Note on Reassembling (4)

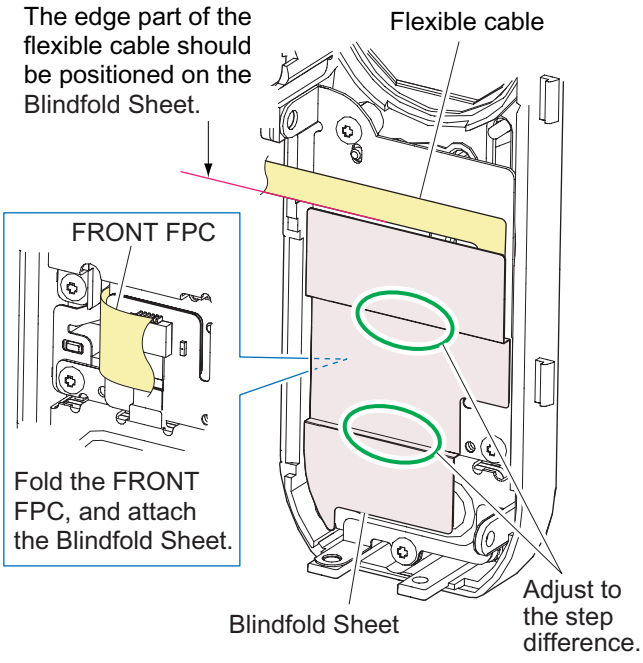

The edge part of the flexible cable should be positioned on the Blindfold Sheet.
Flexible cable
FRONT FPC
Fold the FRONT FPC, and attach the Blindfold Sheet.
Blindfold Sheet
Adjust to the step difference.

Fig. 24

1-16 Disassembly of Front Cover Unit - 2

(1) Remove the CN899, and detach the Microphone Case, the Mic Ass'y, and the Microphone Case Cover from the Back Barrier Plate.
(2) Remove double-sided tape and detach the MICROPHONE RELAY FPC.
(3) Remove one screw (i × 1), and detach the FRONT FPC.

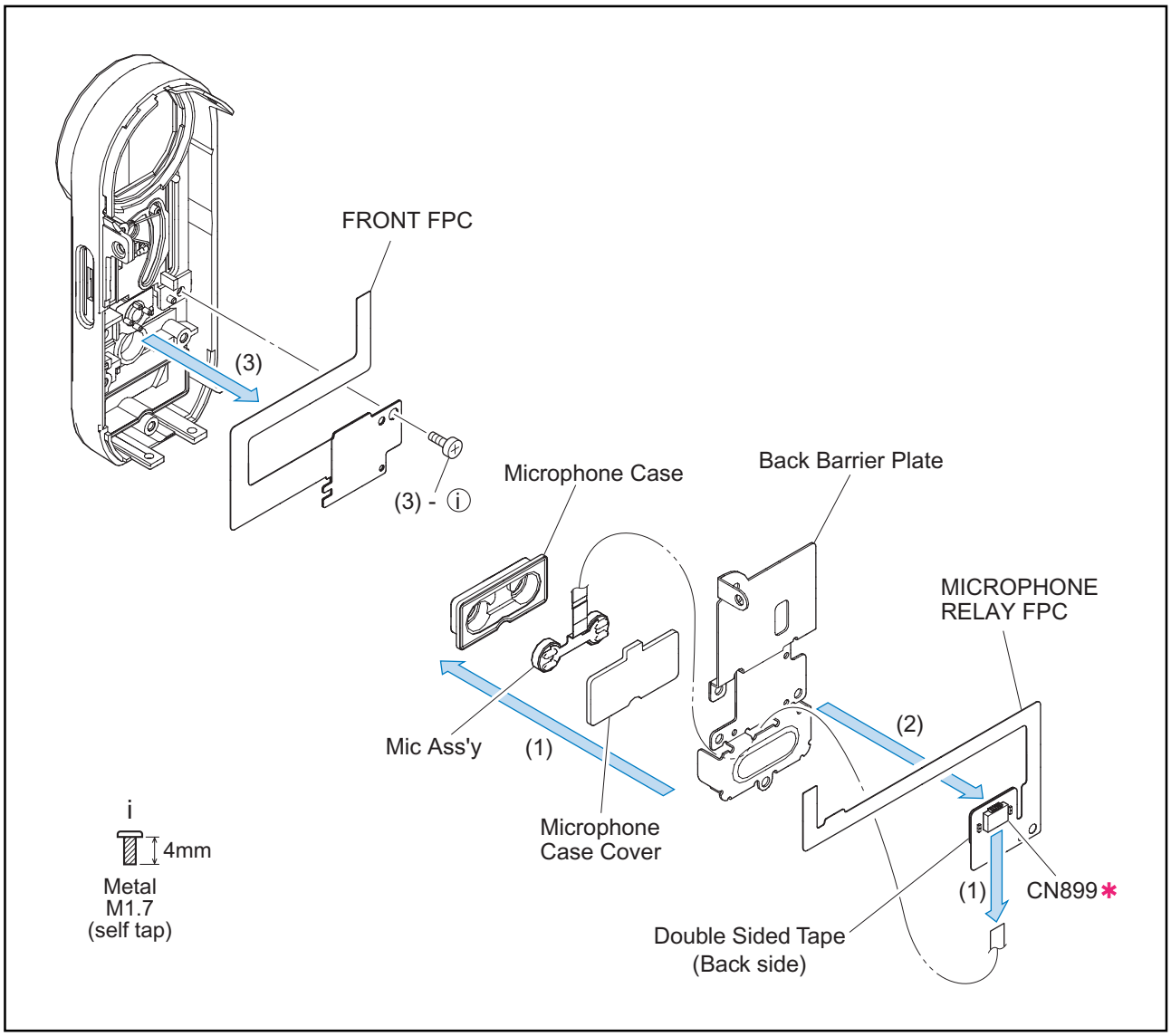


Fig. 25

<Note on Reassembling>

(1) Attach the MICROPHONE RELAY FPC as shown in the figure below.
(2) Attach the Mic Ass'y as shown in the figure below.
(3) Attach the Microphone Case Cover as shown in the figure below.
(4) Attach the Mic Ass'y and the Microphone Case as shown in the figure below.

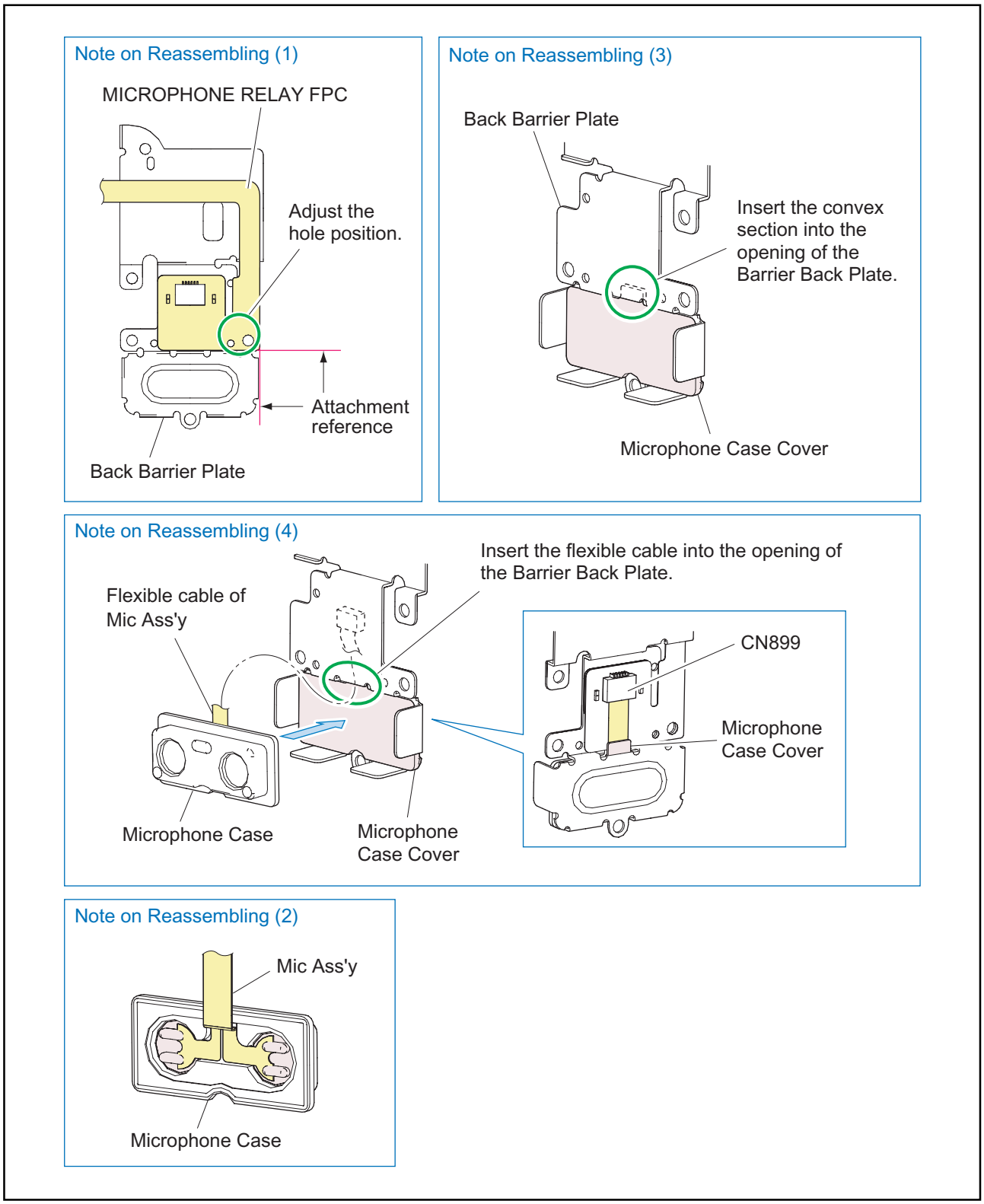

Note on Reassembling (1)
MICROPHONE RELAY FPC
Adjust the hole position.
Attachment reference
Back Barrier Plate
Note on Reassembling (3)
Back Barrier Plate
Insert the convex section into the opening of the Barrier Back Plate.
Microphone Case Cover
Note on Reassembling (4)
Insert the flexible cable into the opening of the Barrier Back Plate.
Flexible cable of Mic Ass'y
CN899
Microphone Case Cover
Microphone Case
Microphone Case Cover
Note on Reassembling (2)
Mic Ass'y
Microphone Case

Fig. 26

1-17 Disassembly of Front Cover Unit - 3

(1) Detach the Spring.
(2) Detach the Barrier Bottom Holder, the Barrier Arm Ass'y, and the Lens Barrier.

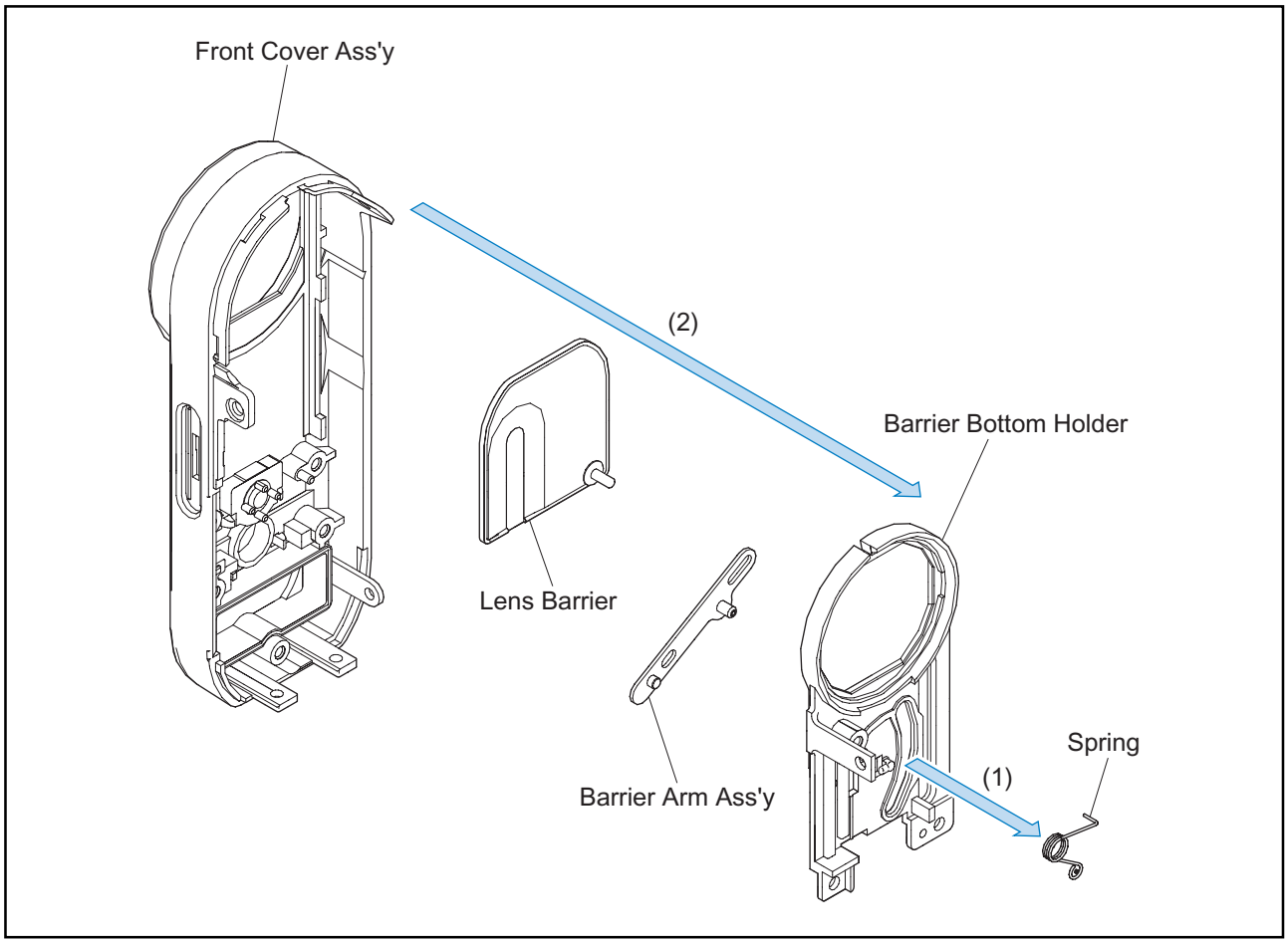


Fig. 27

<Note on Reassembling>

(1) Attach the Lens Barrier, Barrier Arm Ass'y, and Barrier Bottom Holder as shown in the figure below.

(2) Attach the Spring as shown in the figure below.

<Instruction for Supply>

Front Cover Ass'y Rail section and side faces : Hanarl KS-39M (DY9-3053-000)

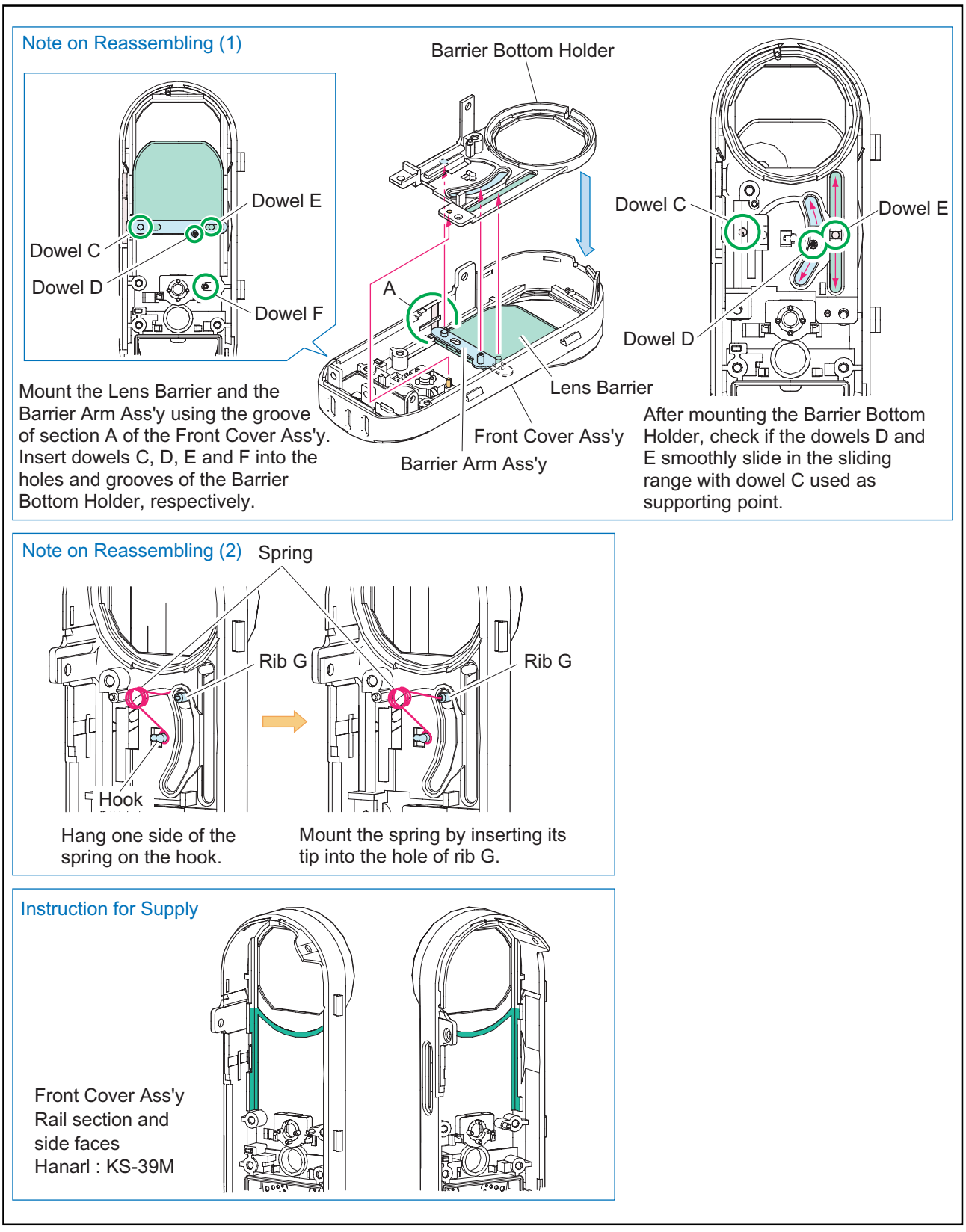

Note on Reassembling (1)
Barrier Bottom Holder
Dowel E
Dowel C
Dowel D
Dowel F
A
Lens Barrier
Front Cover Ass'y
Barrier Arm Ass'y
Mount the Lens Barrier and the Barrier Arm Ass'y using the groove of section A of the Front Cover Ass'y. Insert dowels C, D, E and F into the holes and grooves of the Barrier Bottom Holder, respectively.
Dowel C
Dowel E
Dowel D
After mounting the Barrier Bottom Holder, check if the dowels D and E smoothly slide in the sliding range with dowel C used as supporting point.
Note on Reassembling (2)
Spring
Rib G
Rib G
Hook
Hang one side of the spring on the hook.
Mount the spring by inserting its tip into the hole of rib G.
Instruction for Supply
Front Cover Ass'y
Rail section and
side faces
Hanarl : KS-39M

Fig. 28

1-18 Disassembly of L Cover Unit

(1) Remove four screws (f × 2, g × 2), and detach the Flash Ass'y and the LC Cover. (DC20 E only)
(1) Remove four screws (f × 4), and detach the LC Cover. (DC10 E only)
(2) Slide the Lock Plate, open the Disc Cover, remove two screws (a × 2), and detach the Lock Ass'y and the Gap Sheet.
(3) Remove one screw (g × 1), and detach the Disc Cover Ass'y and the Front Grip Belt.
(4) Remove two screws (a × 2), and detach the Friction Plate.

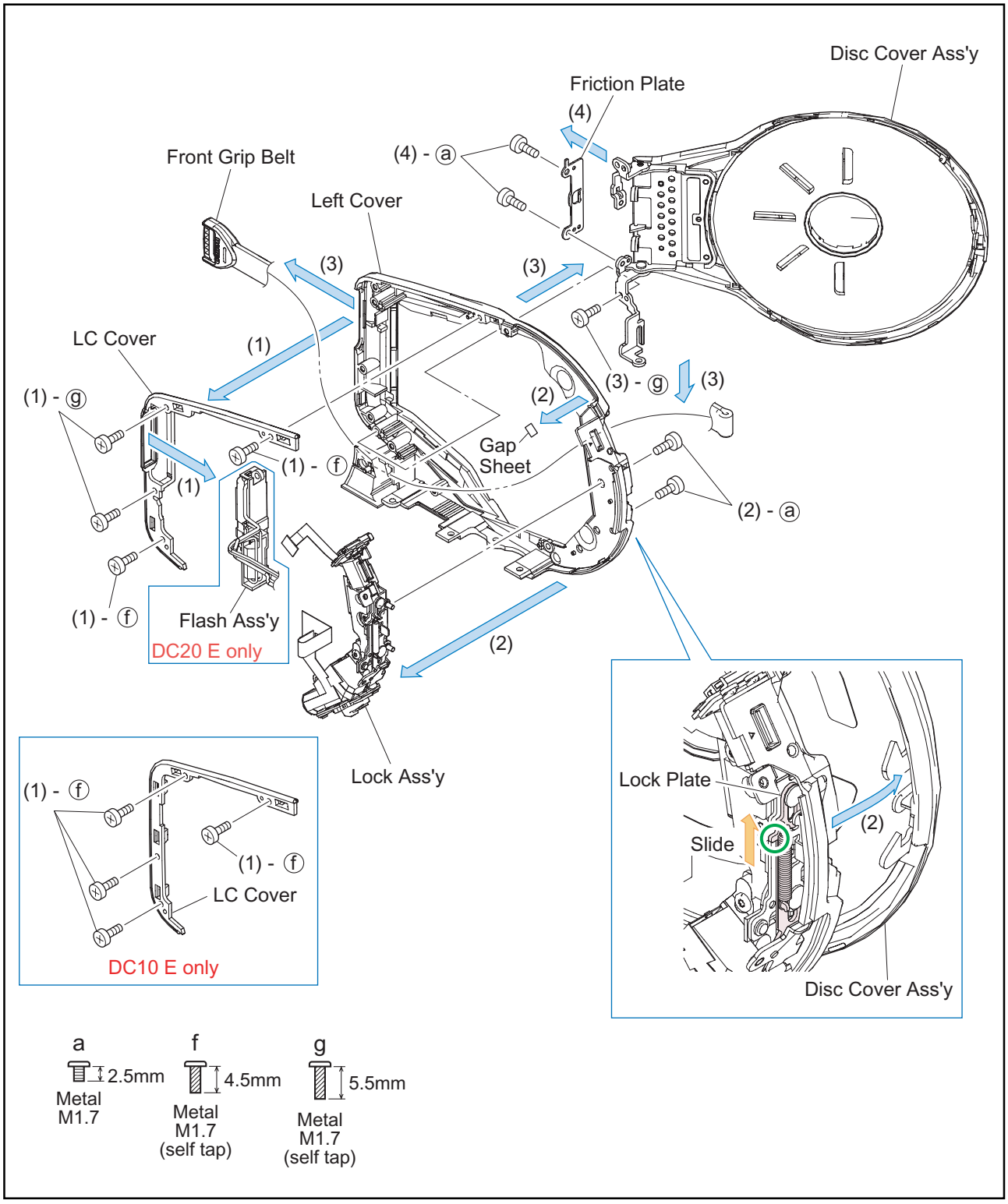


Fig. 29

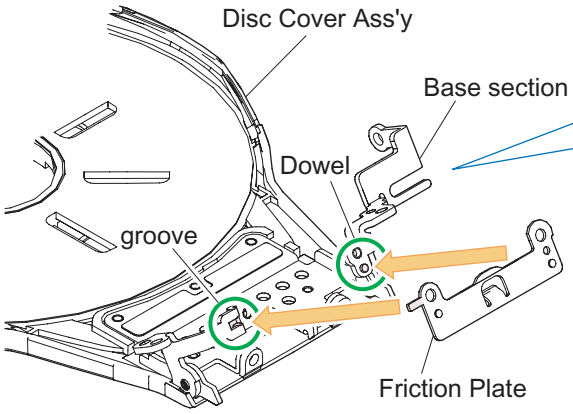
<Note on Reassembling>

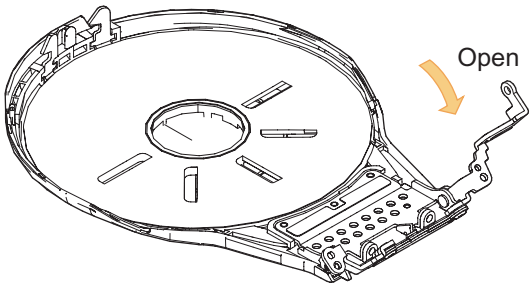
(1) Attach the Friction Plate as shown in the figure below.
(2) Attach the Disc Cover and the Front Grip Belt as shown in the figure below.
(3) Attach the Gap Sheet to the position indicated in the figure below.
(4) Incorporate the Flash Ass'y into the LC Cover and mount it into the Left Cover. Be sure to fasten two screws of the Flash Ass'y first (DC20 E only).

<Instruction for Supply>

Disc Cover Ass'y sliding surface: Hanarl KS-39M (DY9-3053-000)

Note on Reassembling (1)

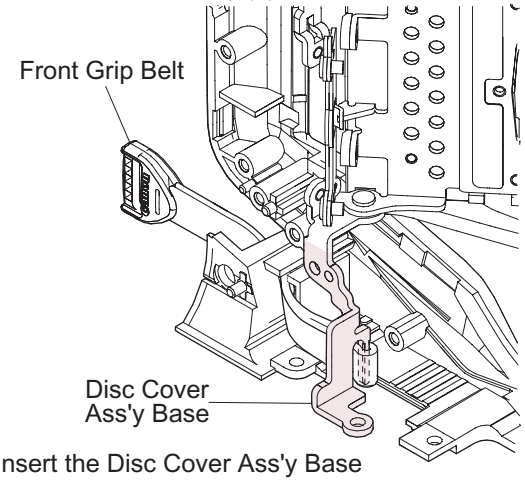




For mounting the Left Cover, ensure that the Disc Cover Ass'y base section should be open as shown in the figure above.

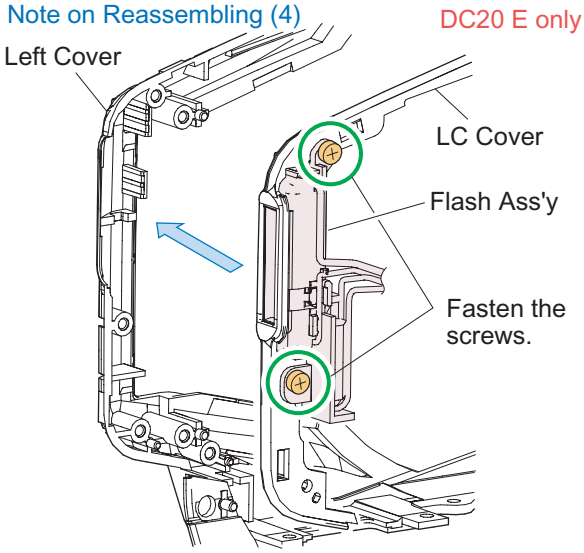
Mount the Friction Plate in the Disc Cover Ass'y with its dowel and hole fit into the groove and dowel, respectively.

Note on Reassembling (2)

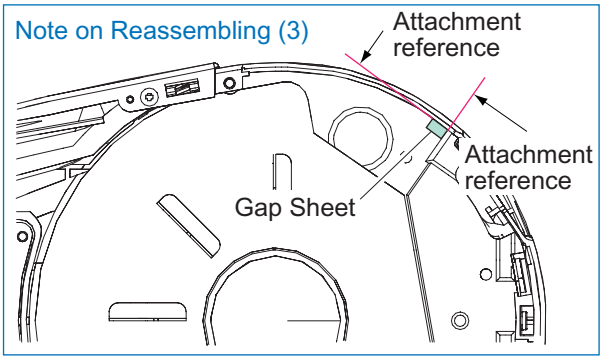


Insert the Disc Cover Ass'y Base into the Front Grip Belt.

Note on Reassembling (4) DC20 E only



Note on Reassembling (3)



Instruction for Supply

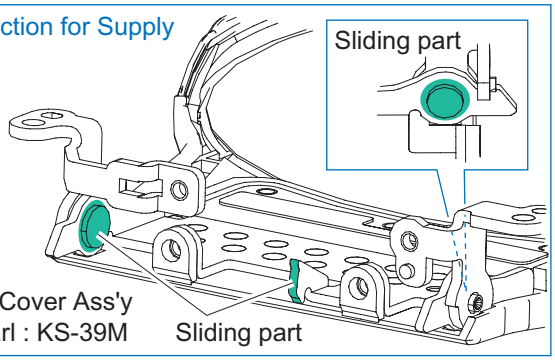


Fig. 30

1-19 Disassembly of Lock Ass'y

(1) Detach the D Cover Switch, the D Cover Spring, and the Light Shield Sheet.
Note : Be careful not to miss the D Cover Spring and not to damage the Switch.
(2) Remove two screws (k × 2), and detach the AV Holder, the AV FPC Ass'y, and the Gap Sheet.
(3) Remove two screws (u × 2), and open the Gear Motor Ass'y.
(4) Remove five screws (k × 5) , and unsolder (α) at four places, and detach the Gear Motor Ass'y and the SW FPC Ass'y.
(5) Detach the Open Knob, the Open Knob Spring, and the Lock Base Sheet.
Note : Take care not to lose the Spring.

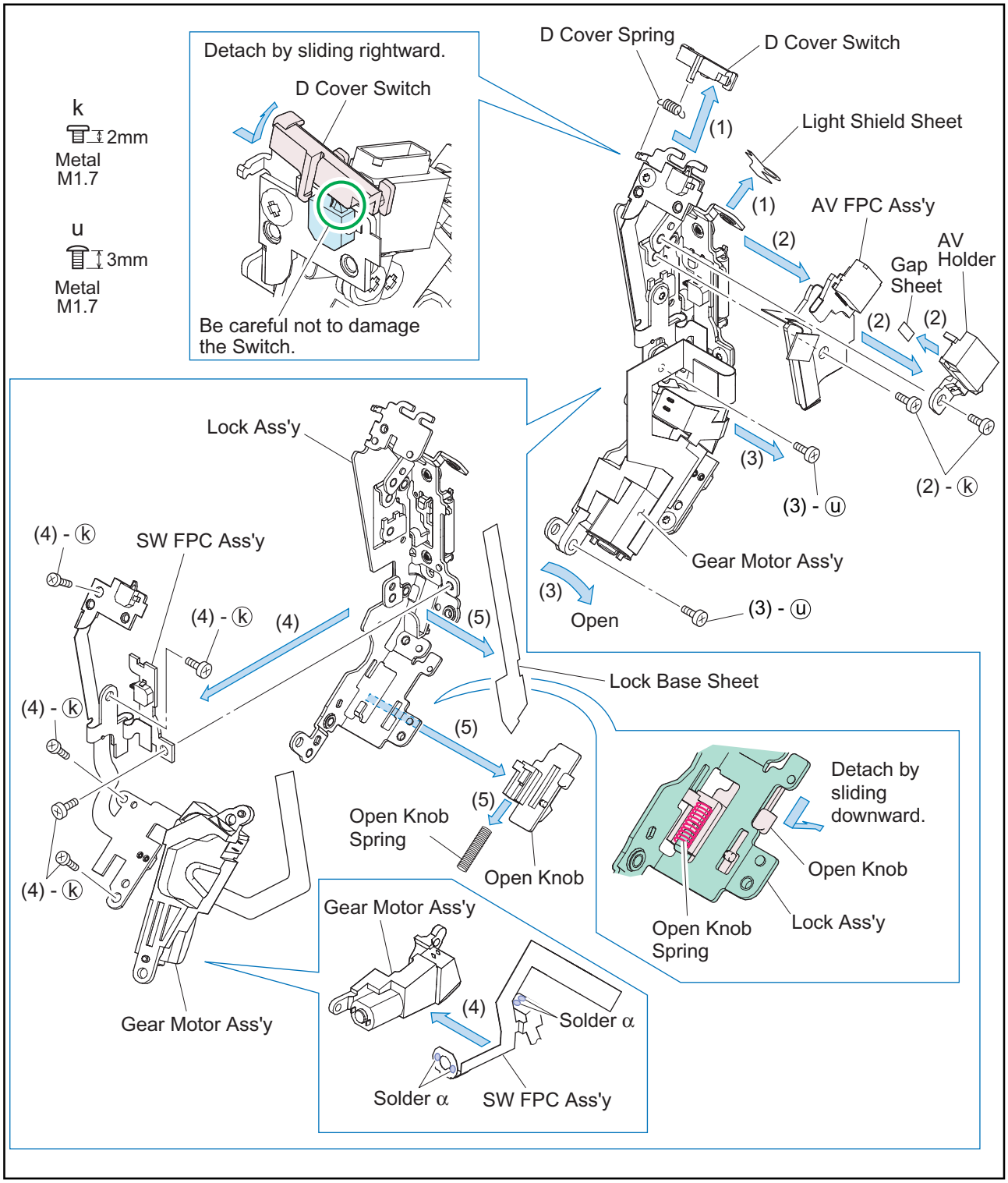


Fig. 31

<Note on Reassembling>

(1) Attach the Open Knob and the Open Knob Spring as shown in the figure below.
(2) Attach the Lock Base Sheet to the position indicated in the figure below.
(3) Solder the SW FPC Ass'y to the Gear Motor and attach them as indicated in the figure below.
(4) Attach the Gap Sheet to the position indicated in the figure below.

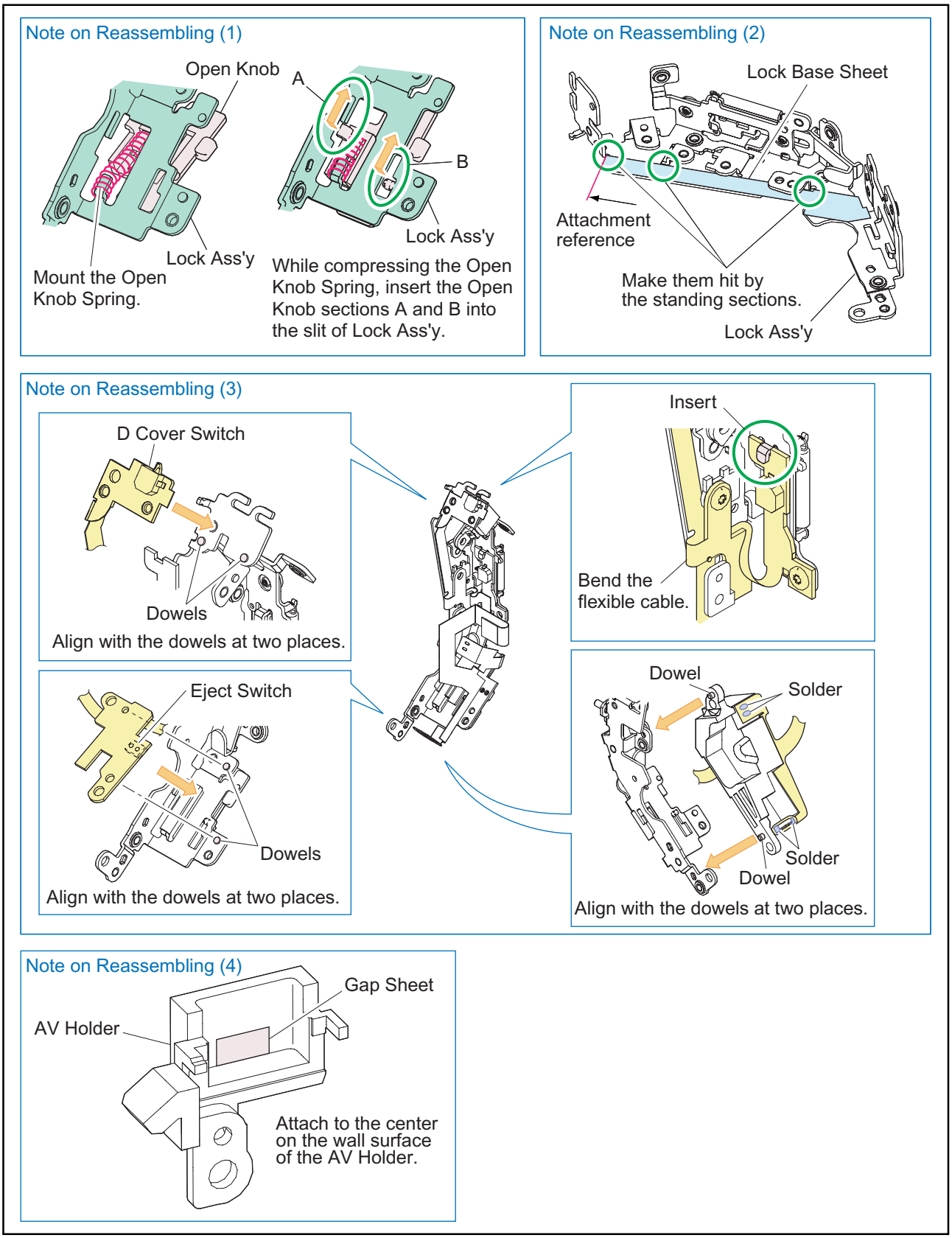


Fig. 32

<Note on Reassembling>

(5) When using the AV FPC Ass'y supplied as a service part, fold it as shown in the figure below.

(6) Attach the AV FPC Ass'y and the AV Holder as shown in the figure below.

(7) Attach the D Cover SW and the D Cover Spring as shown in the figure below.

(8) Attach the Light Shield Sheet to the position indicated in the figure below.

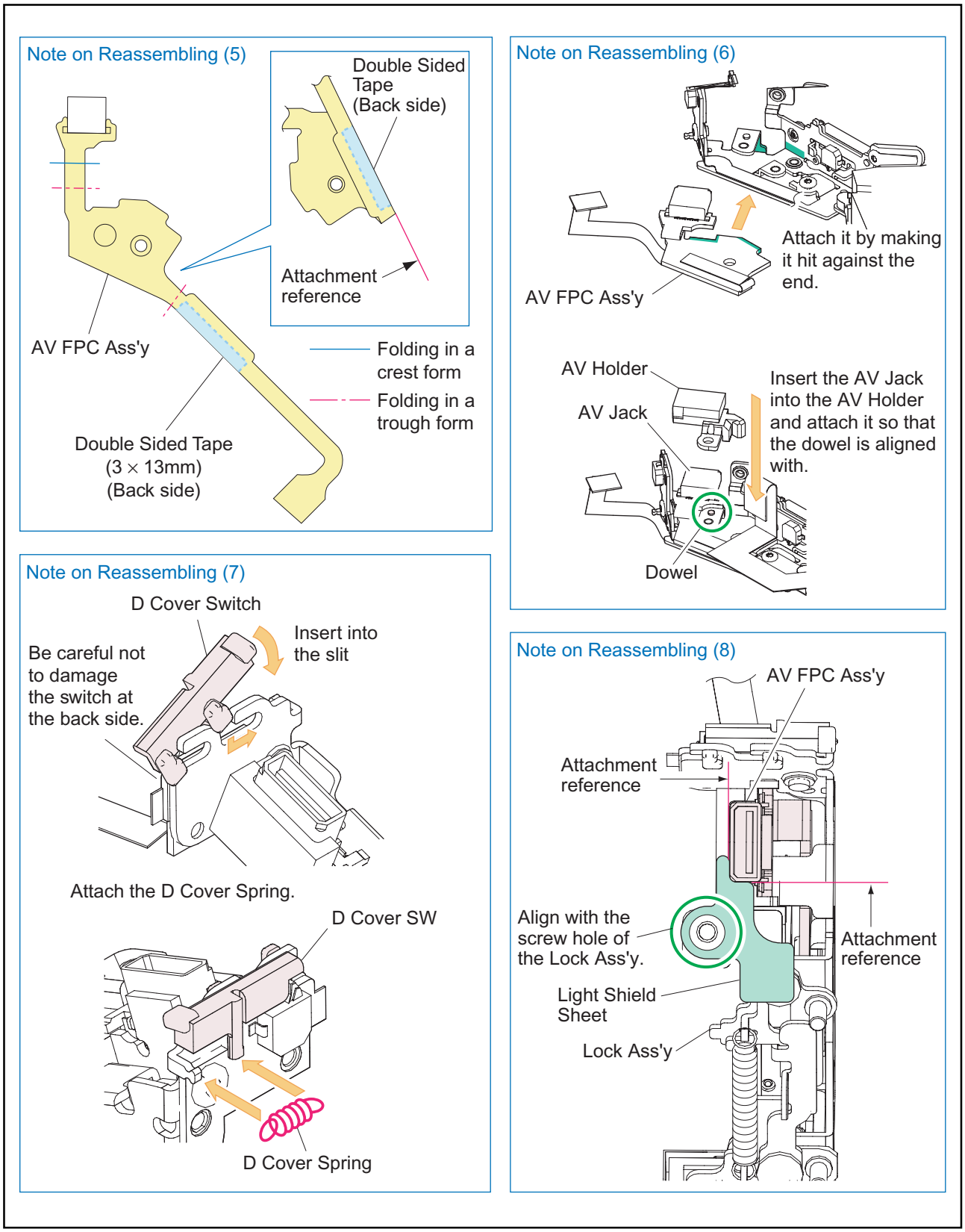

Note on Reassembling (5)
Double Sided Tape (Back side)
Attachment reference
AV FPC Ass'y
Folding in a crest form
Folding in a trough form
Double Sided Tape (3 × 13mm) (Back side)
Note on Reassembling (6)
Attach it by making it hit against the end.
AV FPC Ass'y
AV Holder
AV Jack
Insert the AV Jack into the AV Holder and attach it so that the dowel is aligned with.
Dowel
Note on Reassembling (7)
D Cover Switch
Be careful not to damage the switch at the back side.
Insert into the slit
Attach the D Cover Spring.
D Cover SW
D Cover Spring
Note on Reassembling (8)
AV FPC Ass'y
Attachment reference
Align with the screw hole of the Lock Ass'y.
Attachment reference
Light Shield Sheet
Lock Ass'y

Fig. 33

1-20 Separation of LCD Ass'y

(1) Detach the Right Sponge.
(2) Remove four screws (i × 2, k × 1, l × 1), and detach the Hinge Plate.
(3) Open the LCD Ass'y. Remove two screws (k × 2), and detach the LCD Ass'y.
Note : Take care not to damage the LCD Switch.
(4) Detach the Lid Jig Connection.

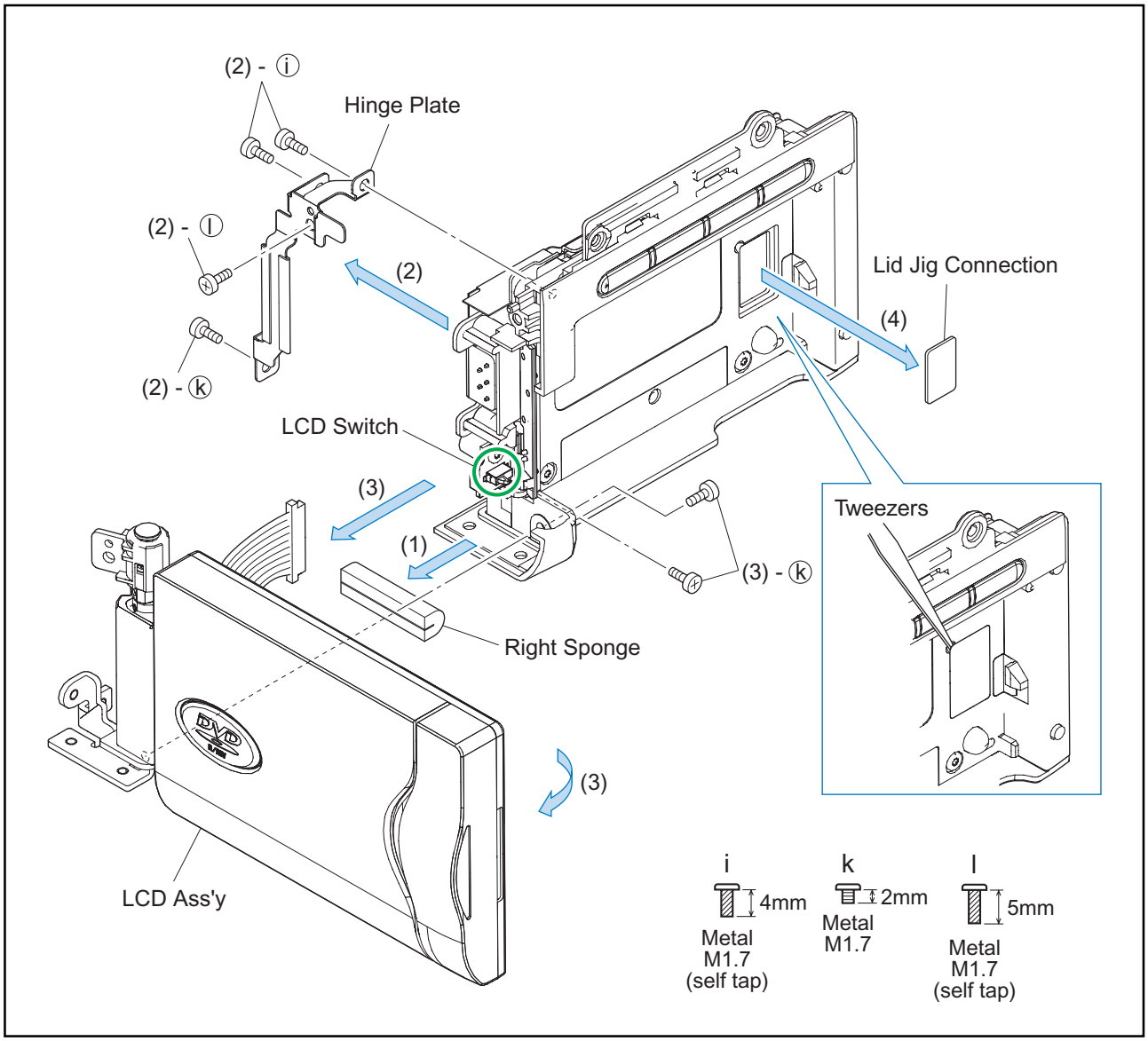


Fig. 34

<Note on Reassembling>

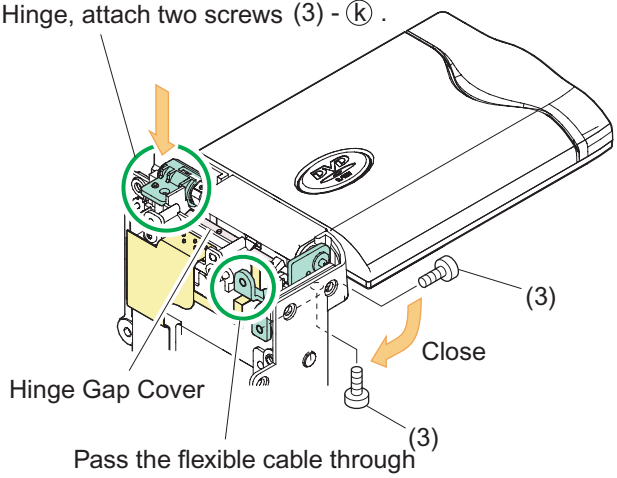
(1) Attach the LCD Ass'y as shown in the figure below.

(2) Attach the Hinge Plate as shown in the figure below.

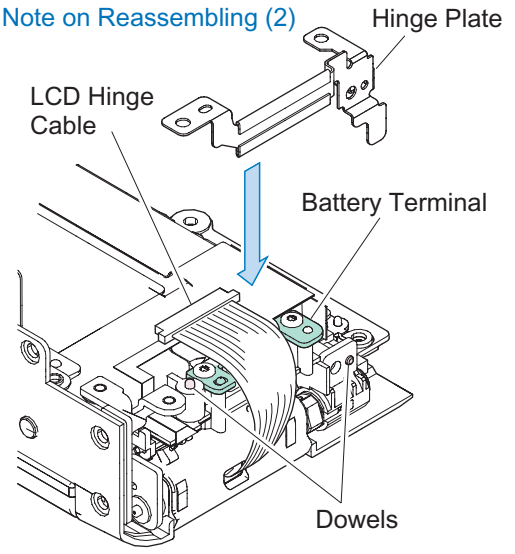
(3) Attach the Right Sponge as shown in the figure below.

Note on Reassembling (1)

Attach the LCD Ass'y and while holding the upper section of the Hinge, attach two screws (3) - ⓚ .

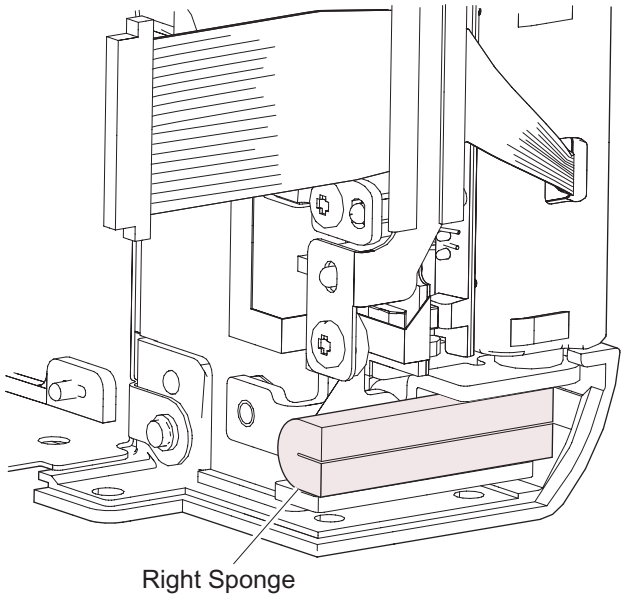


Note on Reassembling (2)



With the LCD Ass'y closed, pass the LCD Hinge Cable through the Battery Terminal, and attach the Hinge Plate so that its holes are aligned with the dowels.

Note on Reassembling (3)



While folding the Right Sponge as indicated in the figure, attach it at the position shown in the figure.

Fig. 35

1-21 Disassembly of LCD Unit - 1

(1) Turn the LCD Hinge Ass'y in the direction indicated in the figure shown below, and then remove two screws (d × 2).
(2) Disengage claws A, B, C, D, E, and F (six positions), and detach the LCD Top Cover Ass'y.
(3) Disconnect the CN901 and the CN903, and detach the LCD Hinge Ass'y.

<Note on Reassembling>

(1) To attach the LCD Top Cover Ass'y, insert the Claws E and F first, and then the Claws D, B, C, and A in this order.

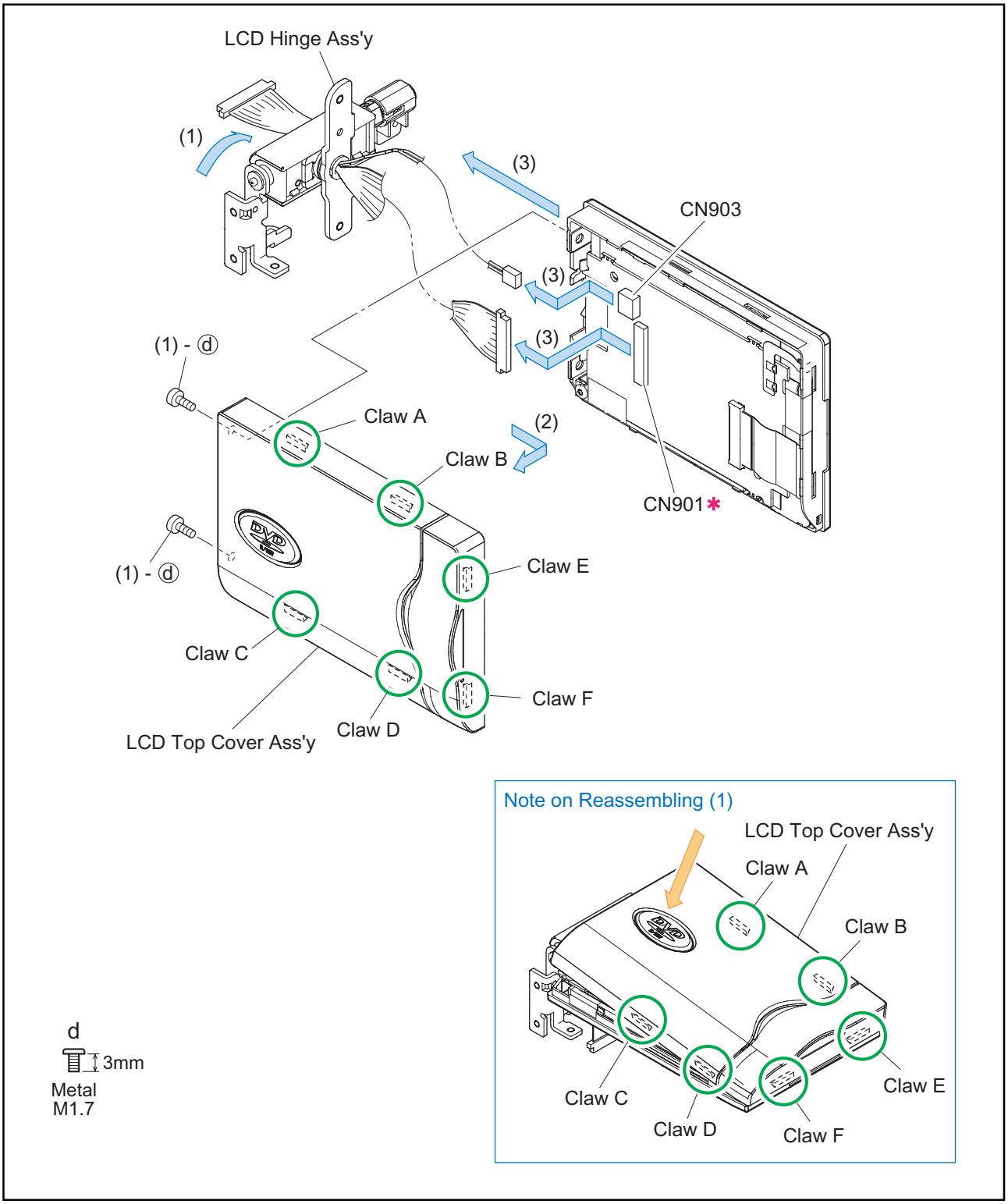


Fig. 36

1-22 Disassembly of LCD Unit - 2

(1) Remove LCD Sheet 2 (2 pcs.).
(2) Remove one screw (k × 1), unsolder part (α), and disconnect the CN902, and then demount the LCD PCB, the LCD Shield sheet, the LCD Back Light Ass'y, the LCD Panel, and the LCD Frame.
(3) Detach the LCD Sheet 1.

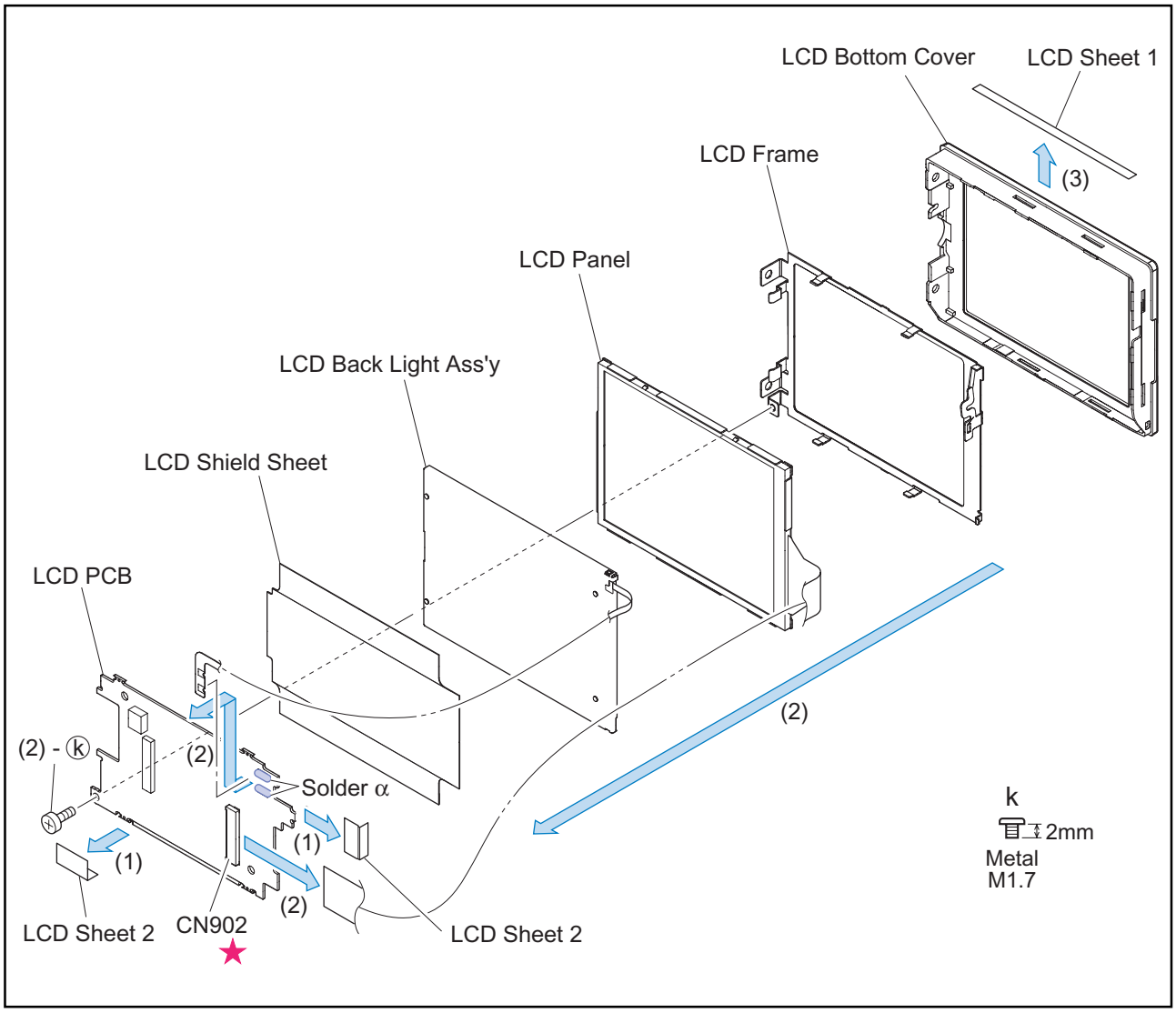


Fig. 37

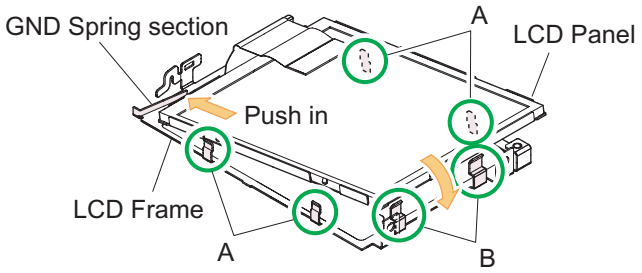
<Note on Reassembling>

(1) Attach the LCD Sheet 1 to the position indicated in the figure below.

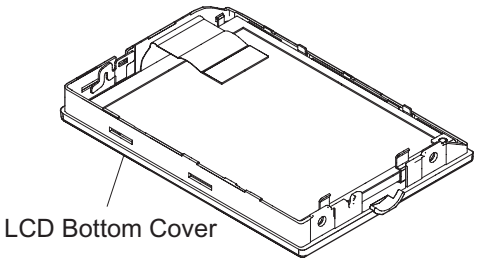
(2) Attach the parts ranging from the LCD Frame to the LCD PCB as shown in the figure below.

(3) Attach the LCD Sheet 2 to the position indicated in the figure below.

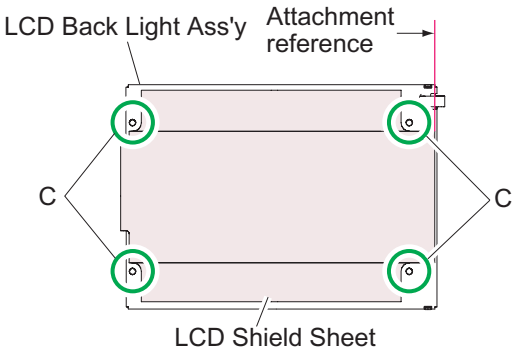
Note on Reassembling (2)



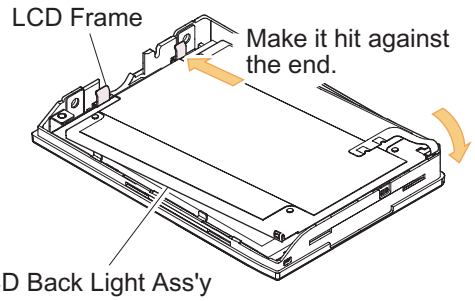
1. Push the LCD Panel into the GND Spring section and then into the sections A and B.



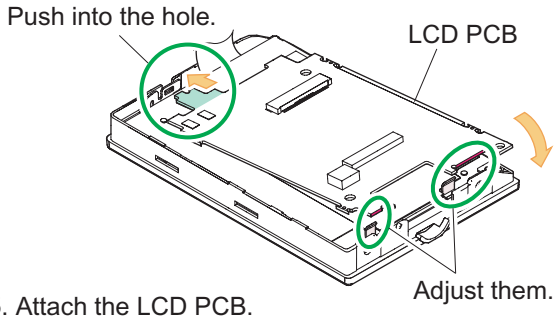
2. Attach it to the LCD Bottom Cover.



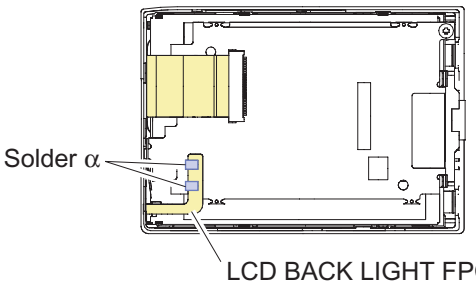
3. With the four sections C aligned with the LCD Back Light Ass'y, stick the LCD Shield Sheet.



4. Attach the LCD Back Light Ass'y.

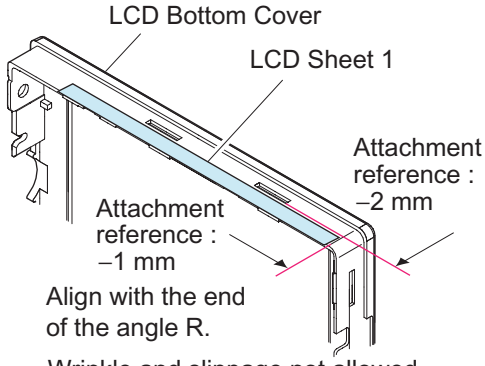


5. Attach the LCD PCB.



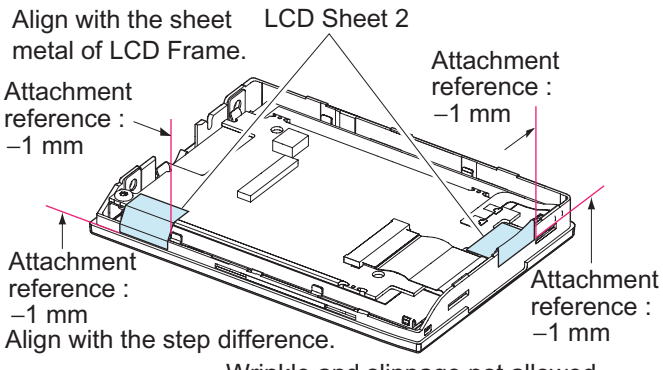
6.Assemble the parts and solder (α) them.

Note on Reassembling (1)



Wrinkle and slippage not allowed.

Note on Reassembling (3)


Align with the sheet metal of LCD Frame.
LCD Sheet 2
Attachment reference : –1 mm
Attachment reference : –1 mm
Attachment reference : –1 mm
Attachment reference : –1 mm
Align with the step difference.

Wrinkle and slippage not allowed.

Fig. 38

1-23 Disassembly of LCD Hinge Ass'y

(1) Disengage four claws A, and detach the Hinge Cover.
Note1 : When pulling the Connector section of the LCD Hinge Ass'y cable from the hole in the Hinge Cover, be careful about damage.
(2) unsolder (α) at two places, and detach the LCD Hinge SW Wire.
(3) Remove two screws (m × 1, r × 1), and detach the Wire Protect and the LCD HINGE PCB.
Note2 : Take care not to damage the LCD Hinge SW.

<Note on Reassembling>
(1) Attach the LCD HINGE PCB as shown in the figure below.
(2) Soldering of the LCD Hinge SW Wire to the LCD HINGE PCB should be done after passing it through the rotating section of the Hinge.

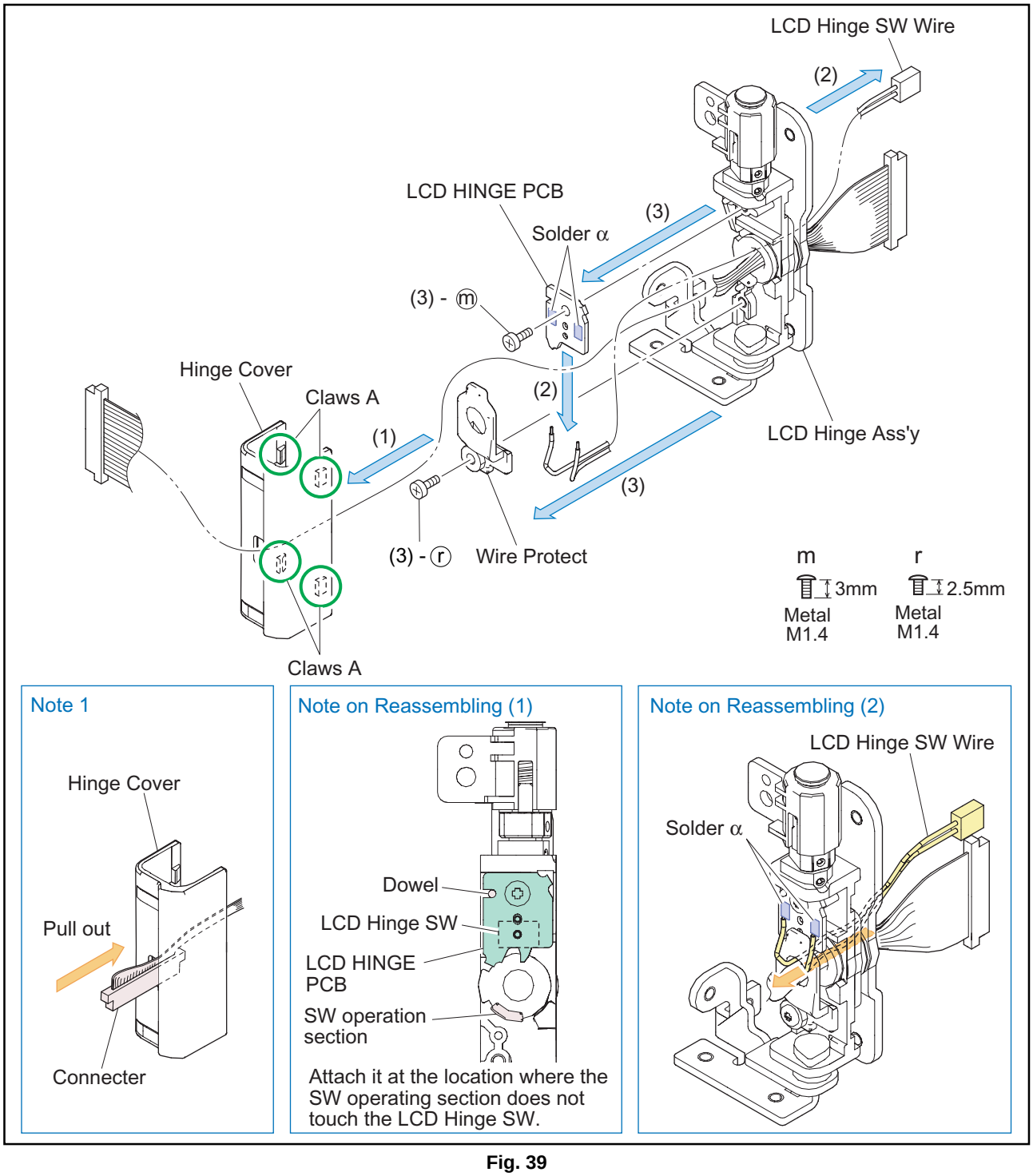


Fig. 39

1-24 Disassembly of CVF Unit - 1

(1) Detach the CVF Dust Cover, and remove one screw (i × 1), and then detach the CVF L Cover and CVF Eyecup.
(2) Peel of the UL Tape, and remove one screw (i × 1), and then detach the CVF GND Plate, the CVF Diop Plate, the CVF Diop Knob, the CVF Diop Rubber, and the CVF Lens Holder.
(3) Disengage two claws A, and detach the CVF Lens.

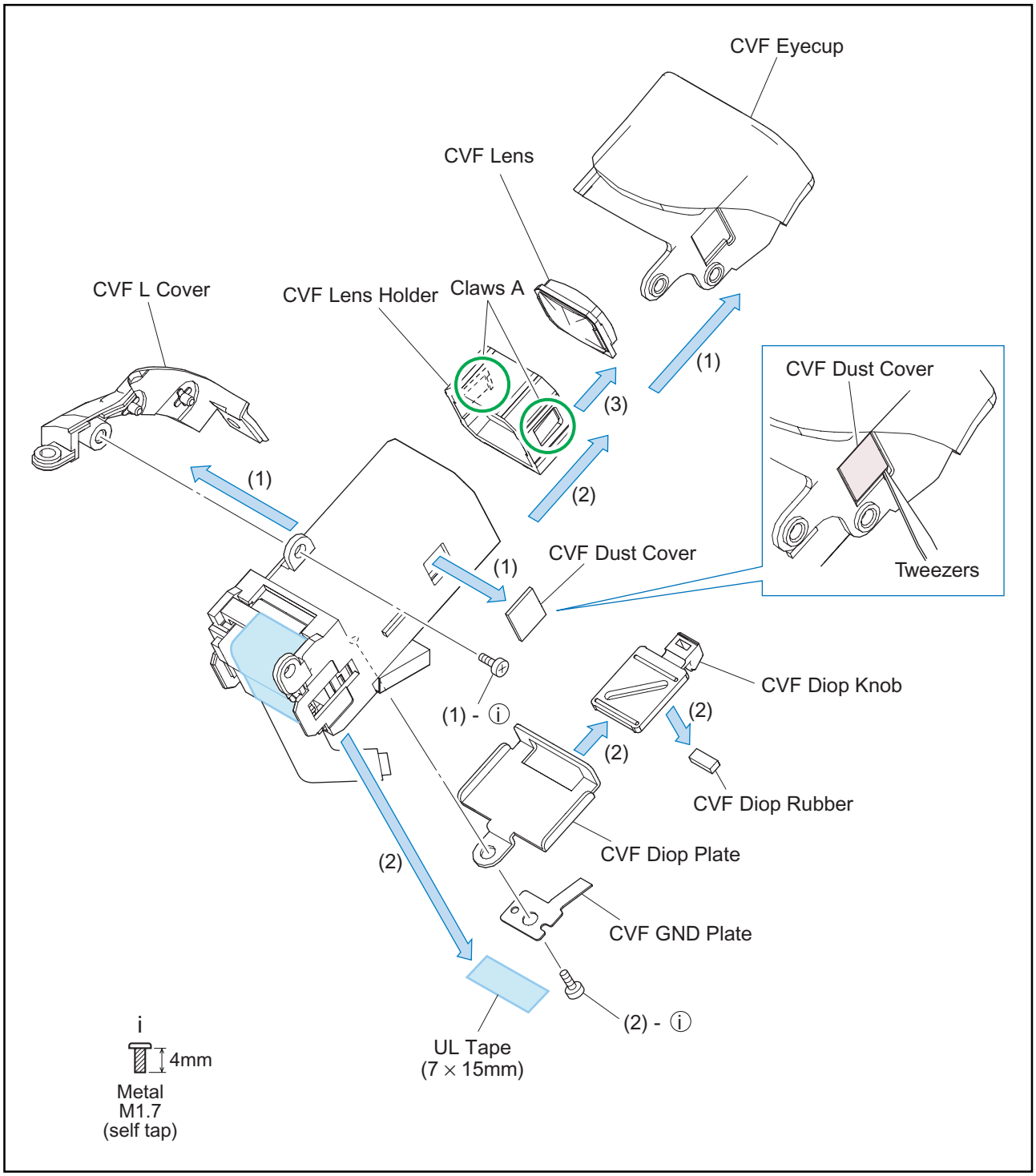


Fig. 40

<Note on Reassembling>

(1) Attach the CVF Lens as shown in the figure below.

(2) Attach the CVF Diop Plate, the CVF Diop Knob, and the CVF Diop Rubber as shown in the figure below.

(3) Attach the UL Tape to the position indicated in the figure below.

<Instruction for Supply>

CVF Diop Rubber sliding surface : Hanarl KS-39M (DY9-3053-000)

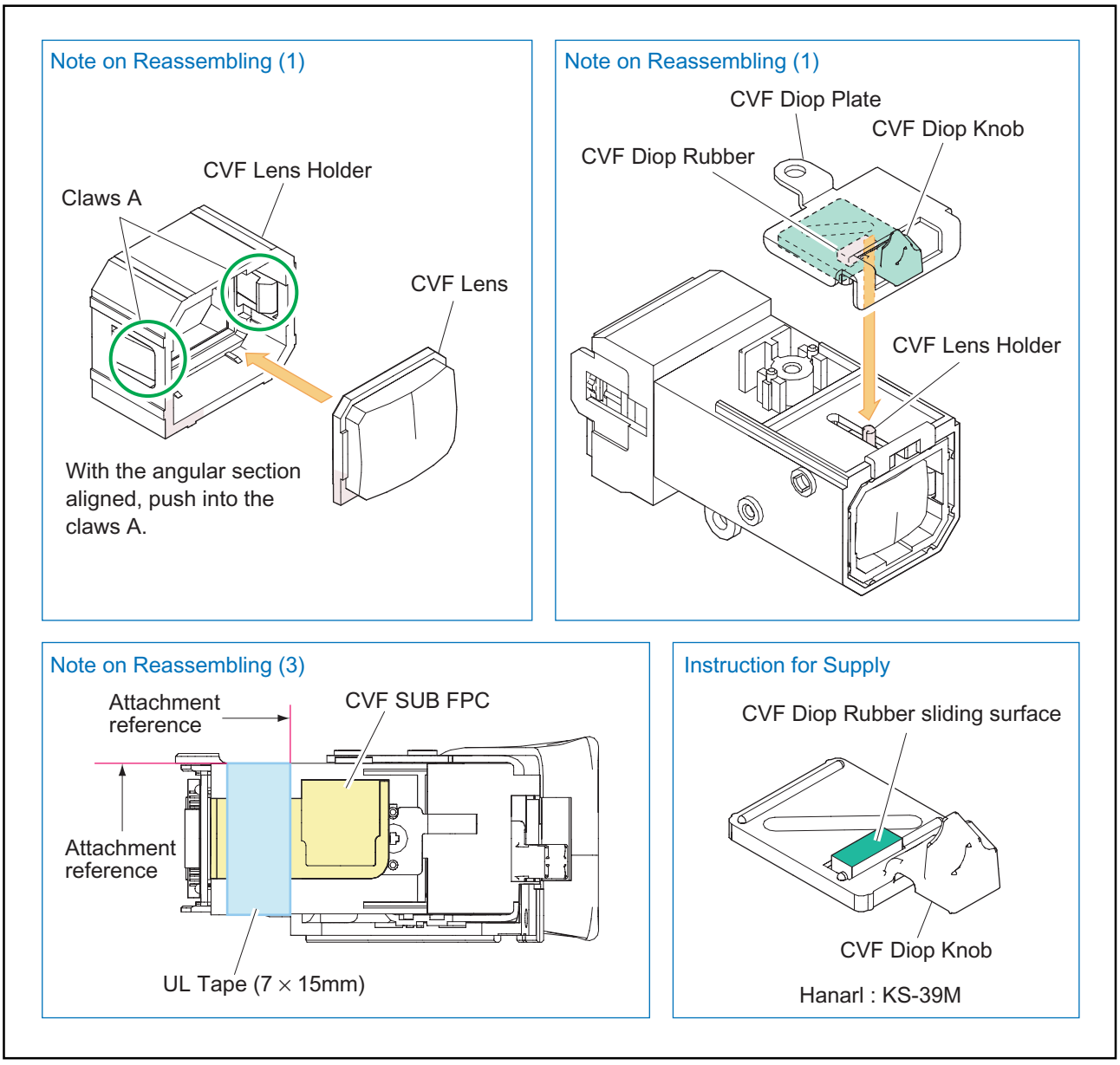


Fig. 41

1-25 Disassembly of CVF Unit - 2

(1) Peel of the UL Tape, disengage two claws A, and disconnect the CN4102, and then detach the CVF PCB, the CVF Reflector, the CVF Diffuser, the CVF Cushion, and the CVF LCD section.
(2) Disconnect the CN4101, and detach the CVF SUB FPC.
(3) Disengage four claws B, and detach the CVF Panel Holder 2, the CVF LCD, and the CVF Panel Holder 1.
Note : Since the CVF LCD is made of glass alone, be careful of its handling.

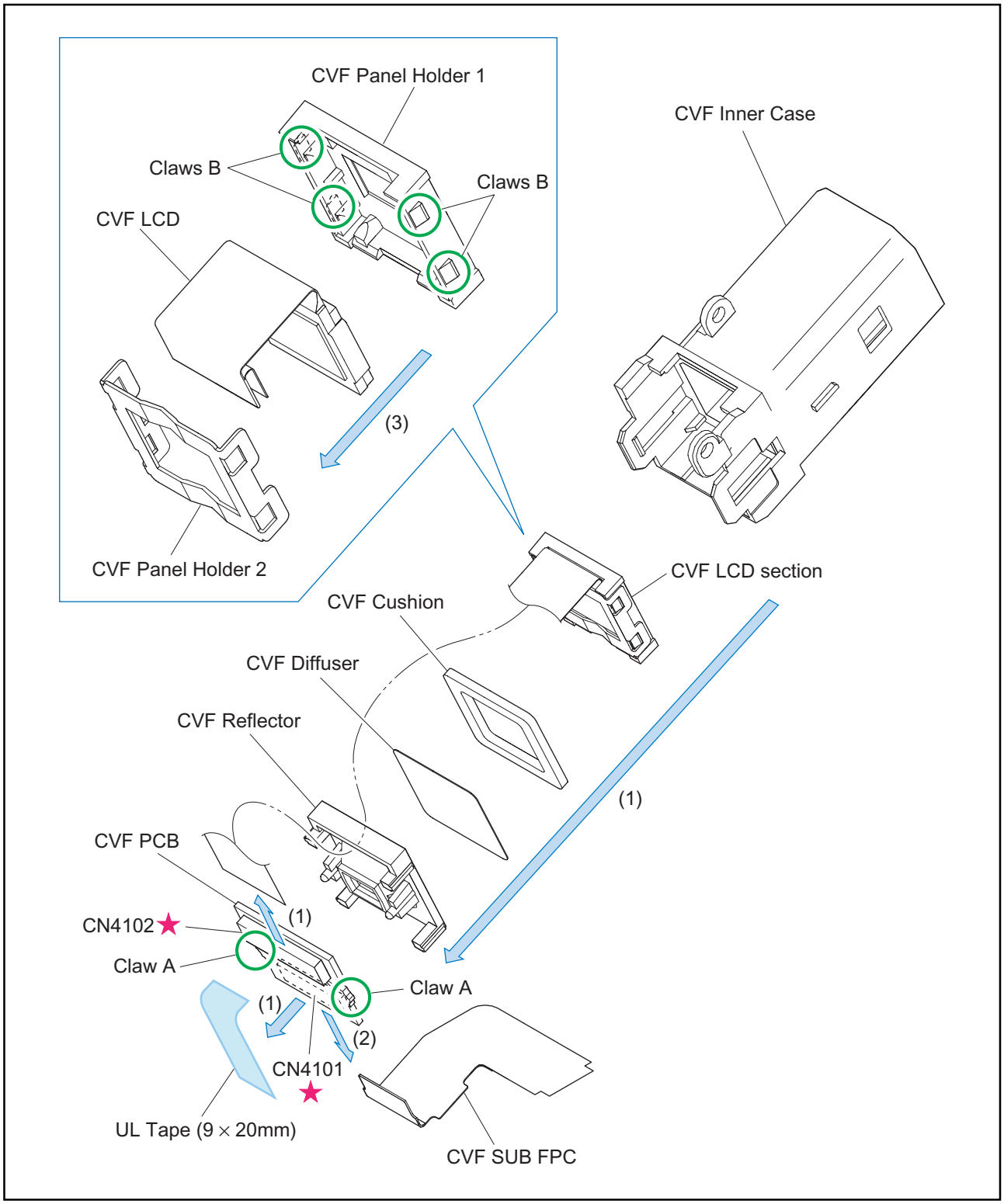


Fig. 42

<Note on Reassembling>

(1) Attach the CVF Panel Holder 2, the CVF LCD, and the CVF Panel Holder 1 as shown in the figure below.
(2) Attach the CVF Reflector as shown in the figure below.
(3) The CVF PCB should be attached with the CVF SUB FPC mounted, as indicated in the figure.
(4) Attach the UL Tape to the position indicated in the figure below.
(5) Before using the CVF SUB FPC supplied as a service part, provide preliminary folding at the position indicated in the figure below.

<Instruction for Supply>

Sliding Rail section of CVF Inner Case : Hanarl KS-39M (DY9-3053-000)

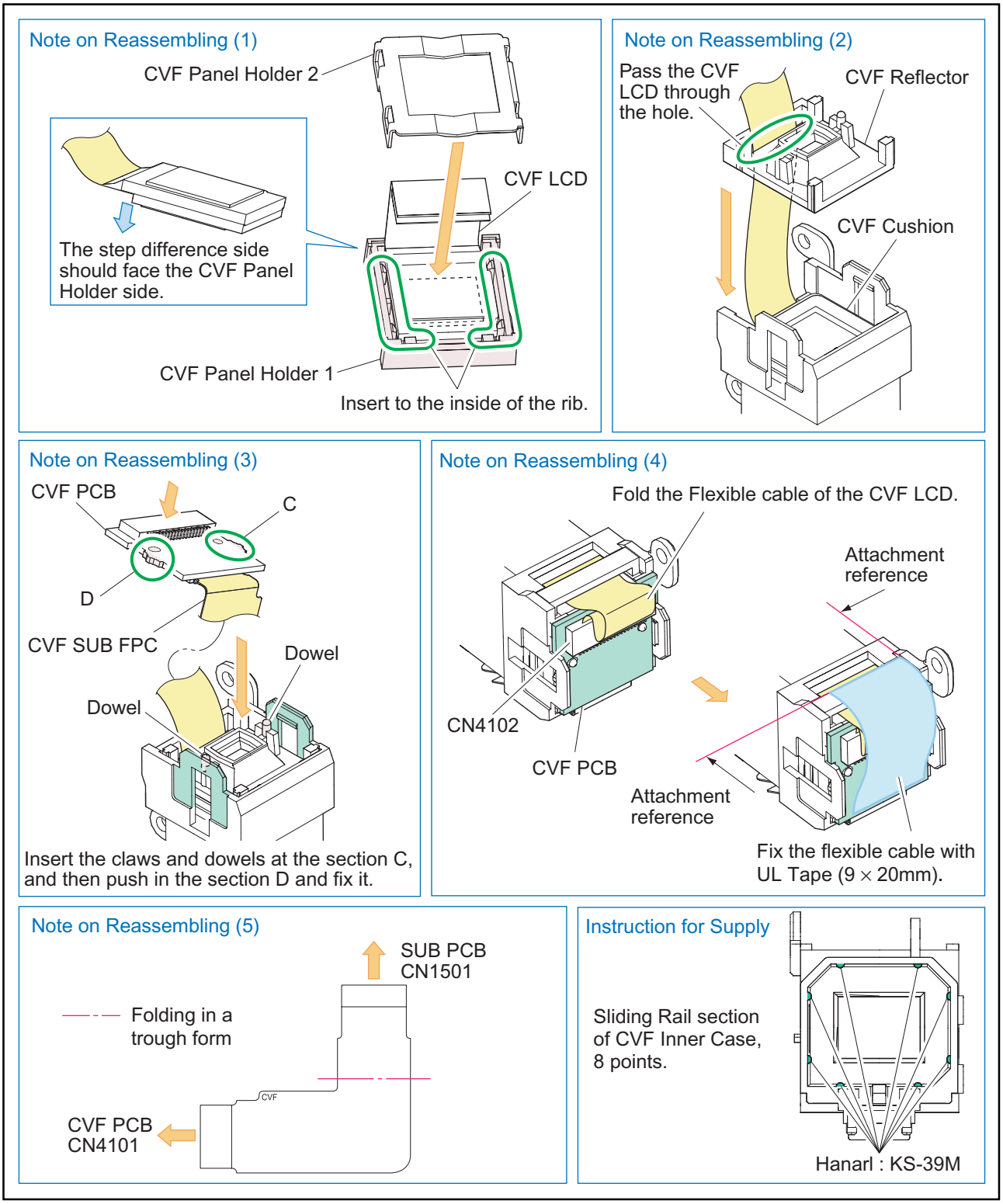

Note on Reassembling (1)
CVF Panel Holder 2
CVF LCD
The step difference side should face the CVF Panel Holder side.
CVF Panel Holder 1
Insert to the inside of the rib.
Note on Reassembling (2)
Pass the CVF LCD through the hole.
CVF Reflector
CVF Cushion
Note on Reassembling (3)
CVF PCB
C
D
CVF SUB FPC
Dowel
Dowel
Insert the claws and dowels at the section C, and then push in the section D and fix it.
Note on Reassembling (4)
Fold the Flexible cable of the CVF LCD.
Attachment reference
CN4102
CVF PCB
Attachment reference
Fix the flexible cable with UL Tape (9 × 20mm).
Note on Reassembling (5)
SUB PCB
CN1501
Folding in a trough form
CVF
CVF PCB
CN4101
Instruction for Supply
Sliding Rail section of CVF Inner Case, 8 points.
Hanarl : KS-39M

Fig. 43

1-26 Disassembly of Rear Cover Unit - 1

(1) Open the Jack Cover. Remove three screws (k × 1, l × 2), and detach the Jack Ass'y, the Jack Cover, and the Right Side Gasket.
(2) Remove one screw (l × 1), unsolder (α), and detach the DC JACK PCB and the DC Wire.
(3) Remove one screw (e × 1), and detach the USB FPC Ass'y and the USB Holder.

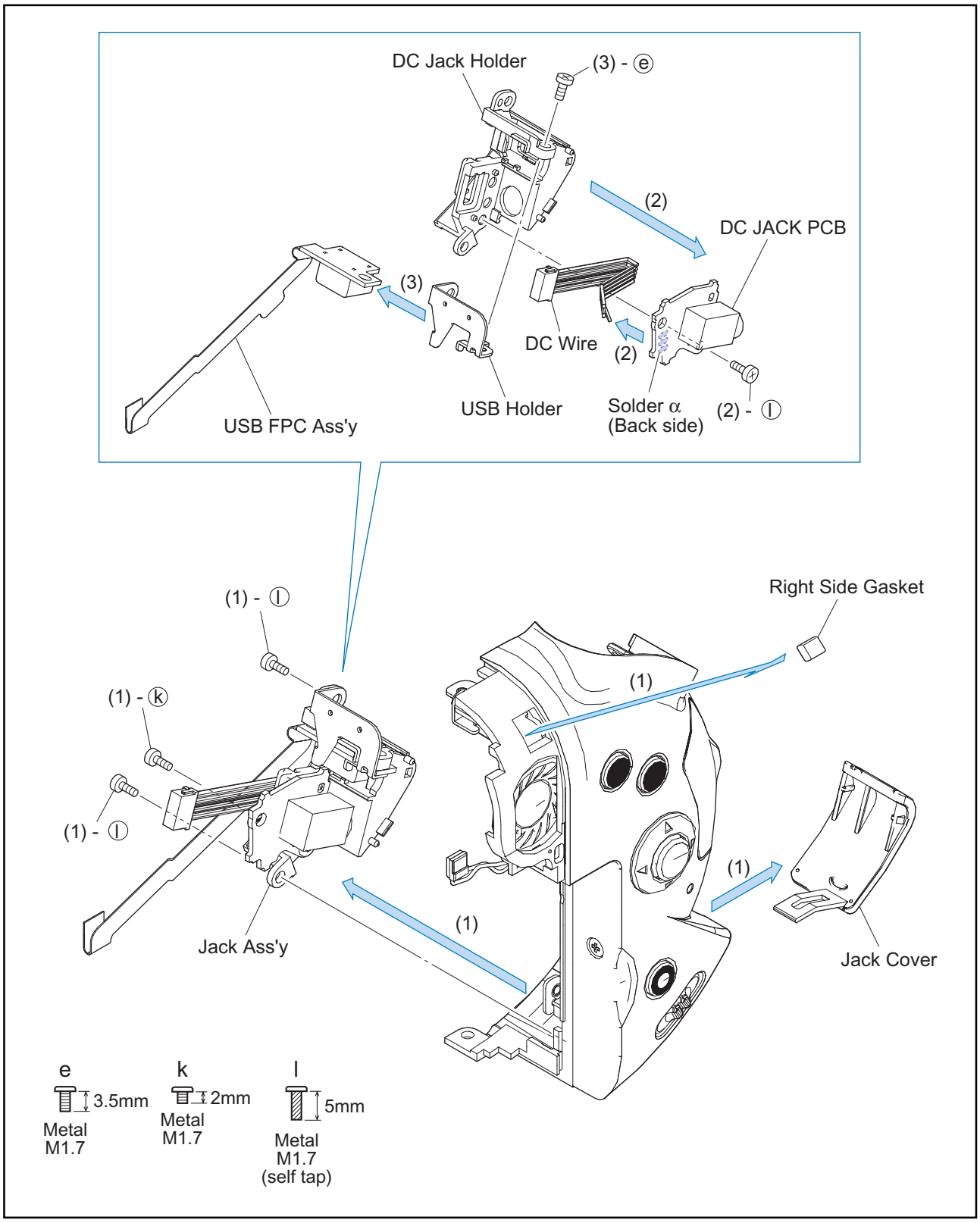
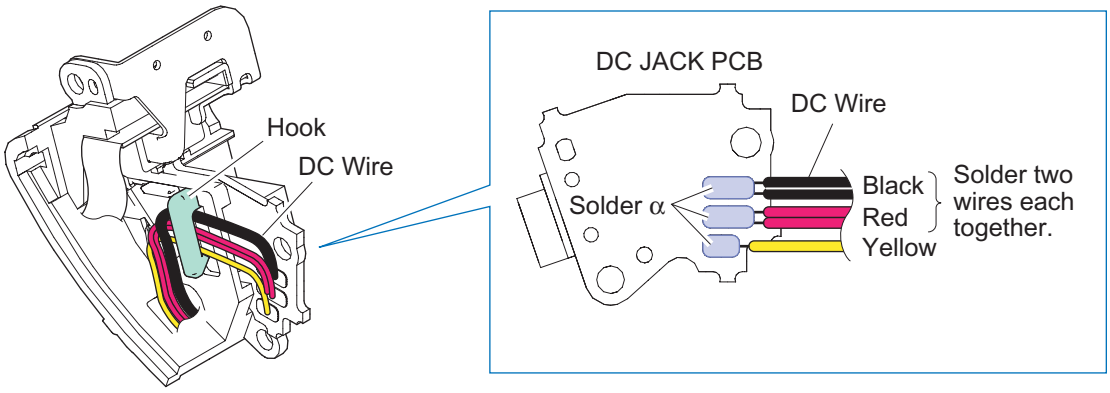


Fig. 44

<Note on Reassembling>

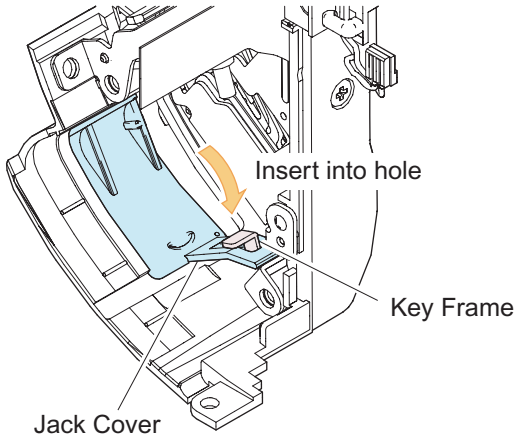
(1) Attach the DC Wire and the DC JACK PCB as shown in the figure below.
(2) Attach the Jack Cover as shown in the figure below.
(3) Before using the USB FPC supplied as a service part, provide preliminary folding at the position indicated in the figure below.
(4) Attach the Right Side Gasket onto the Key Flame.

Note on Reassembling (1)

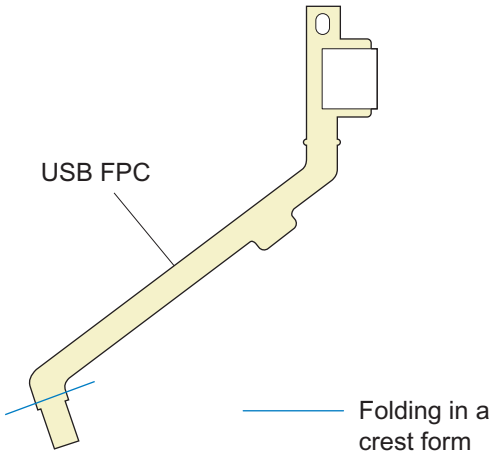


Mount the DC Wire by passing it through the hook.

Note on Reassembling (2)



Note on Reassembling (3)



Note on Reassembling (4)

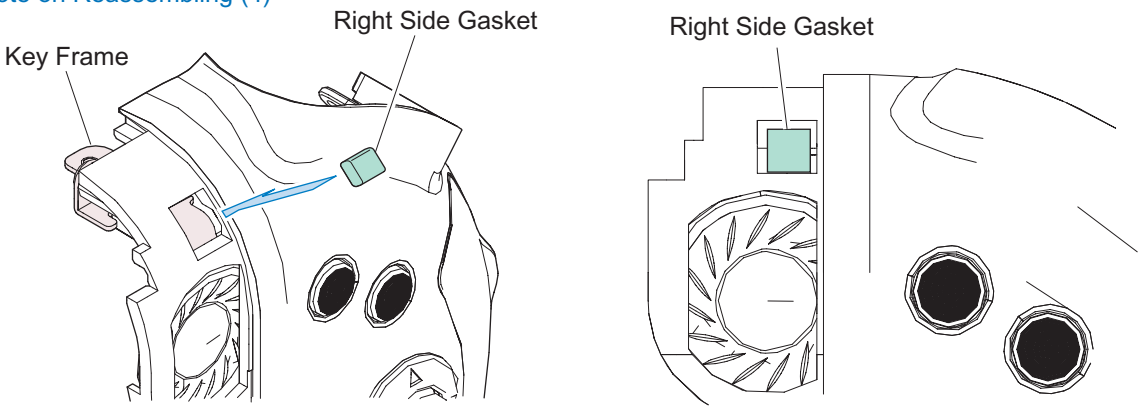


Fig. 45

1-27 Disassembly of Rear Cover Unit - 2

(1) Remove four screws (i × 3, k × 1), and detach the Key Frame, the Speaker, and the Rear Key FPC Ass'y.
(2) unsolder (α) at two places, and detach the Speaker Wire.
(3) Detach the Center SW Knob and the Center SW knob Dumper from the Rear Key FPC Ass'y.
(4) Detach the SD Cover.

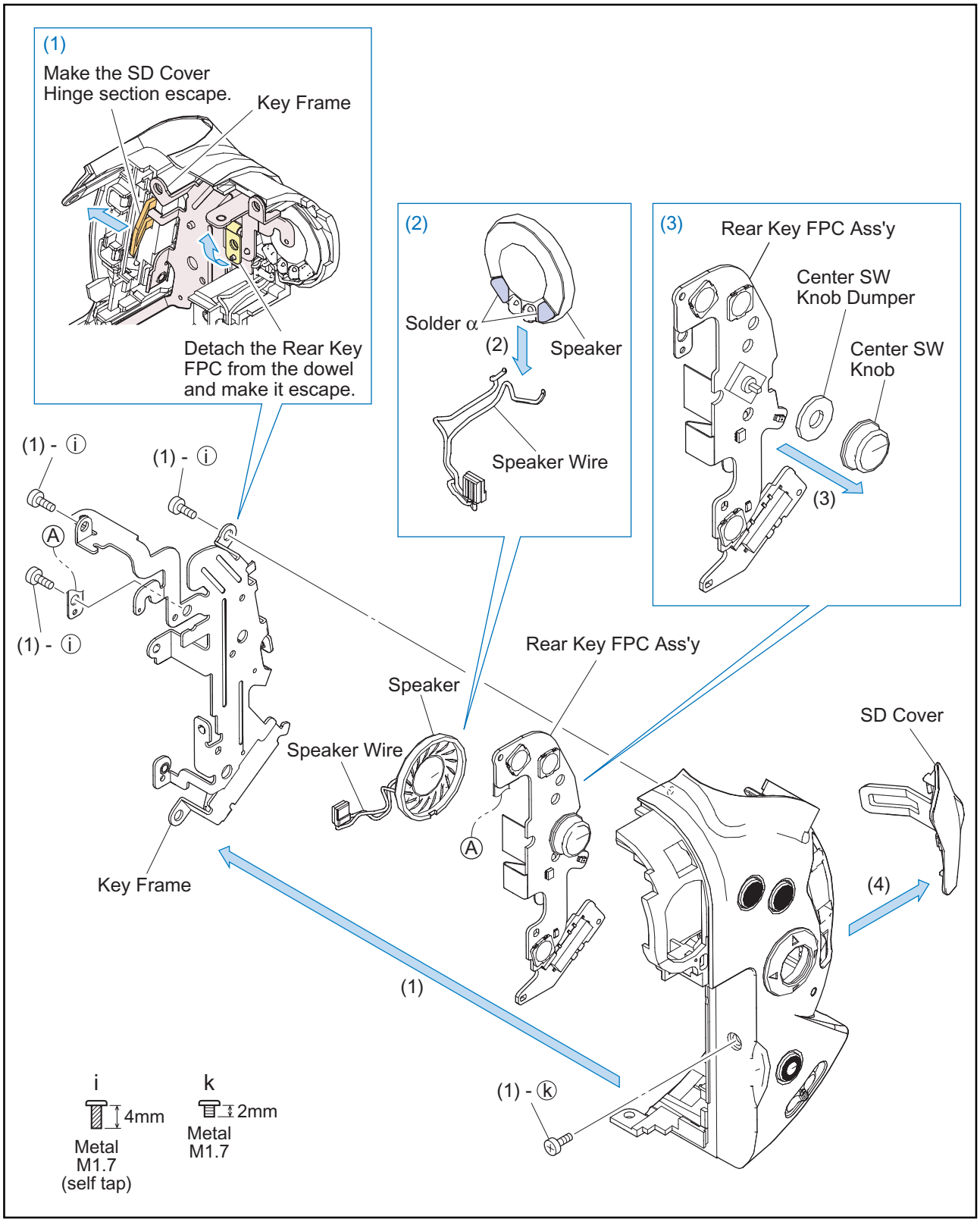
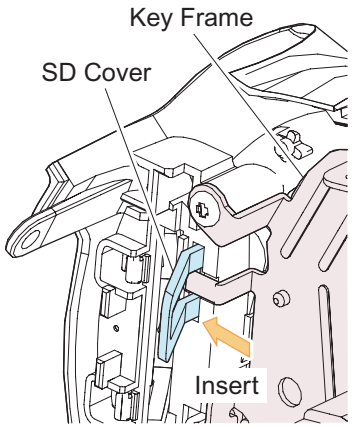


Fig. 46

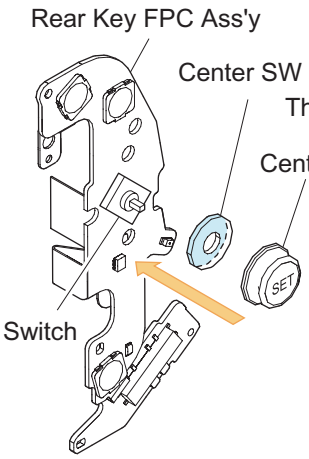
<Note on Reassembling>

(1) Attach the SD Cover as shown in the figure below.
(2) Attach the Center SW Knob and the Center SW Knob Dumper as shown in the figure below.
(3) Attach the Rear Key FPC Ass'y as shown in the figure below.
(4) Treat the Speaker Wire as shown in the figure.
(5) Tighten the Key Frame together with the Rear Key FPC at one place.

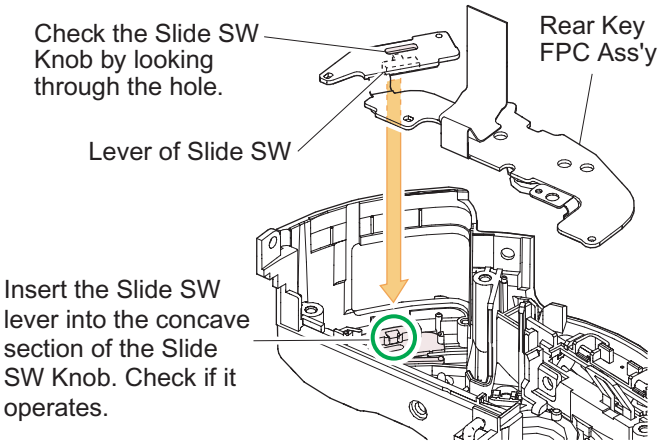
Note on Reassembling (1)



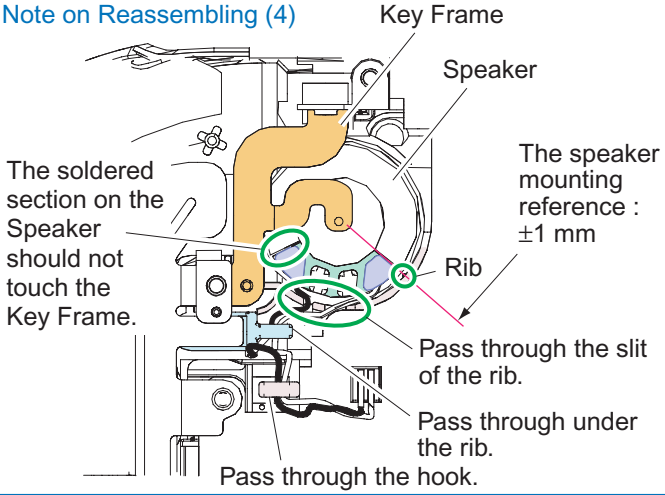
Note on Reassembling (2)


Rear Key FPC Ass'y
Center SW Knob Dumper
The shiny face should be on the SW side.
Center SW Knob
Align the characters (SET) with the horizontal direction.
Switch
SET

Note on Reassembling (3)


Check the Slide SW Knob by looking through the hole.
Rear Key FPC Ass'y
Lever of Slide SW
Insert the Slide SW lever into the concave section of the Slide SW Knob. Check if it operates.

Note on Reassembling (4)


Key Frame
Speaker
The soldered section on the Speaker should not touch the Key Frame.
The speaker mounting reference : ±1 mm
Rib
Pass through the slit of the rib.
Pass through under the rib.
Pass through the hook.

Note on Reassembling (5)

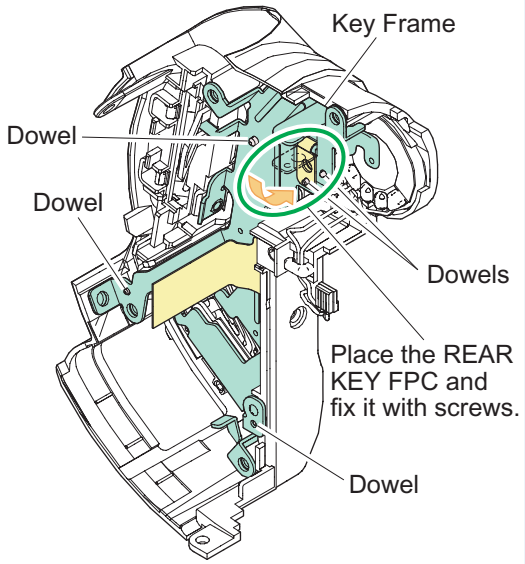


Fig. 47

1-28 Disassembly of Rear Cover Unit - 3

(1) Detach the Slide SW Knob, the Rear SW Knob, the DP Window, the Menu SW Knob, and the Card Access Window.

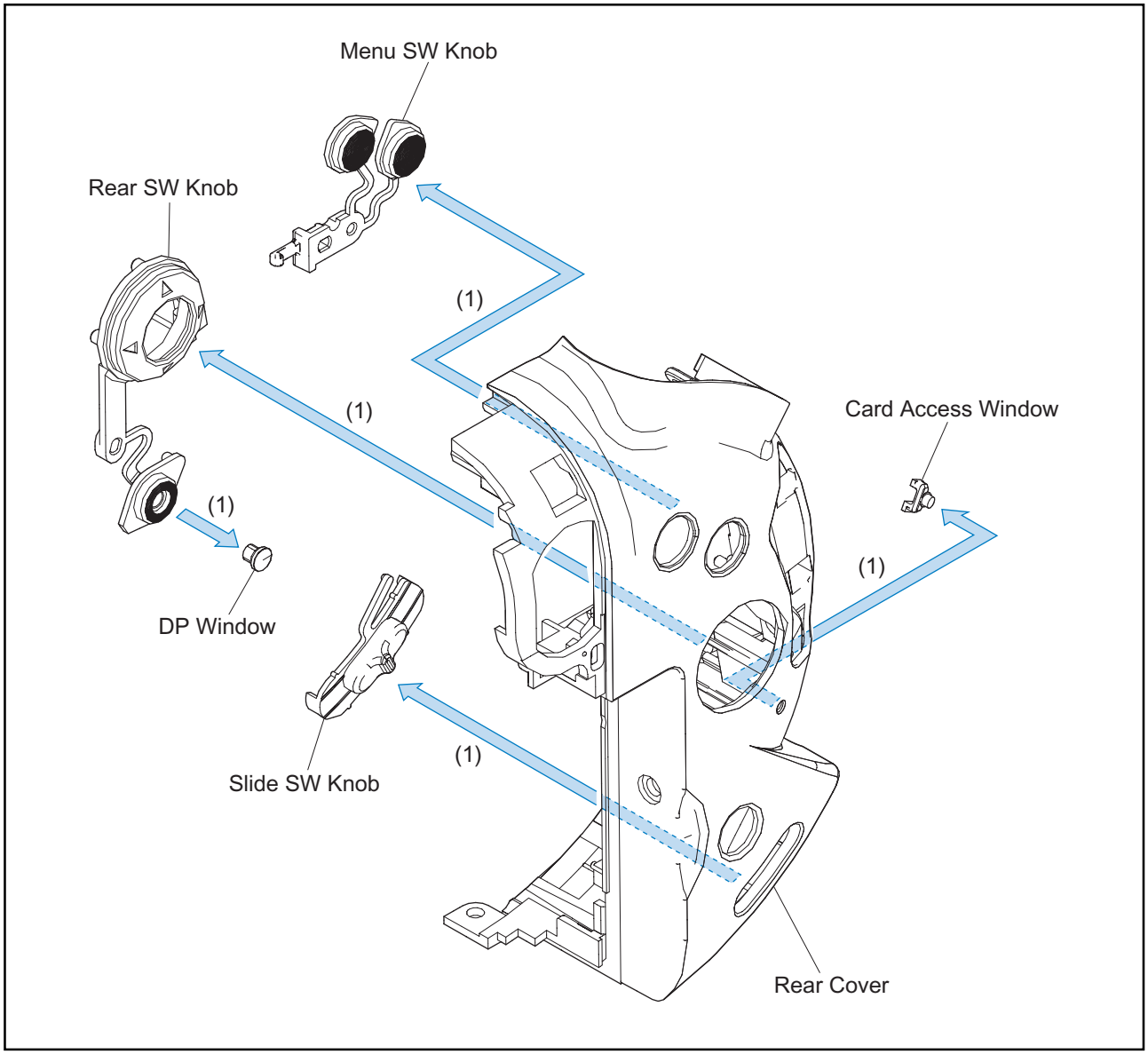


Fig. 48

1-29 Disassembly of Camera Unit

(1) Remove two screws (i × 2) , and detach the Lens Holder, the Right Side Gasket, the ST Wire Protector (DC20 E only), the CCD PCB Absorber, the CCD GND Plate, and the Lens Sponge.
Note : Take care not to deform the CCD GND Plate.

(2) Remove one screw (a × 1) , and detach the CCD Heatsink Plate.

(3) Remove two screws (f × 2) , and detach the CCD Ass'y, the CCD Rubber, the Optical IR Filter, and the Shield Sheet.

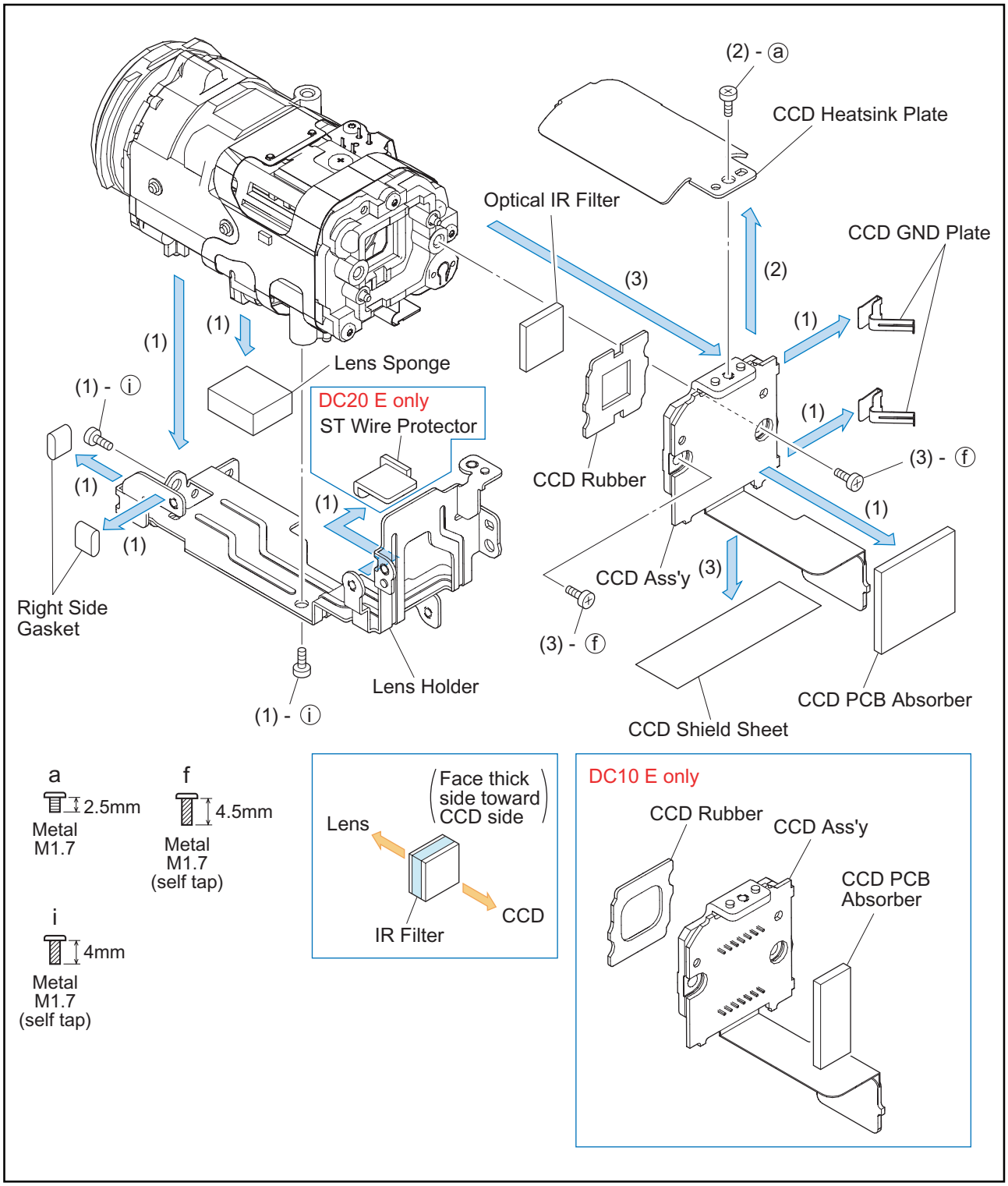


Fig. 49

<Note on Reassembling>

(1) Attach the CCD Shield Sheet as shown in the figure below.
(2) Attach the Right Side Gasket and the ST Wire Protector (DC20 E only) to the position indicated in the figure below.
(3) Attach the Lens Holder as shown in the figure below.
(4) Attach the Lens Sponge as shown in the figure below.
(5) Attach the CCD PCB Absorber as shown in the figure below.

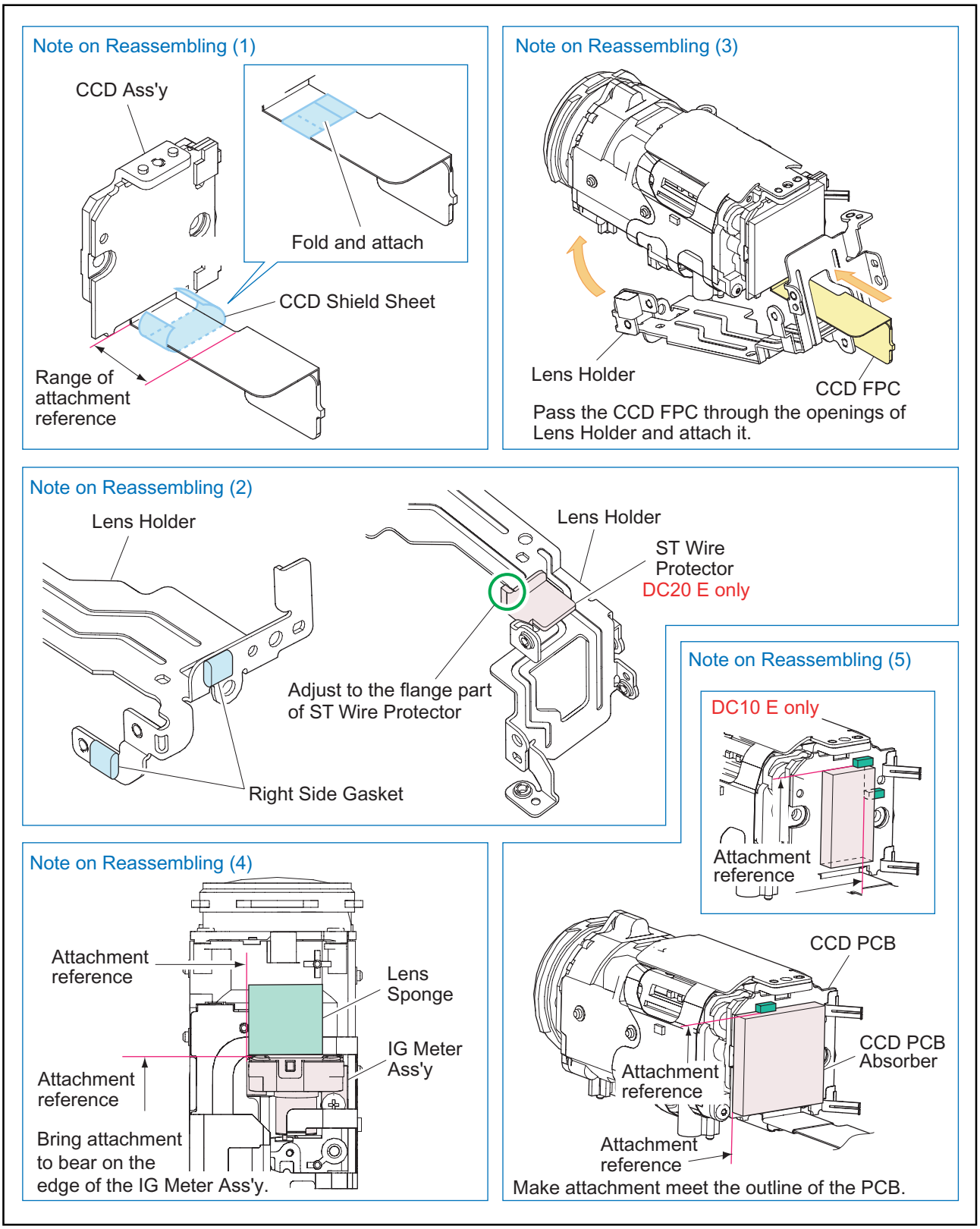


Fig. 50

1-30 Disassembly of Lens Unit

(1) Peel off the UL Tape.

(2) Remove eight screws (n × 5, o × 1, p × 1, q × 1), unsolder points α, and detach the IG Meter Ass'y, the PZ Motor, the Photo Interrupter, the Guide Bar (× 3), and the SR Head, etc.

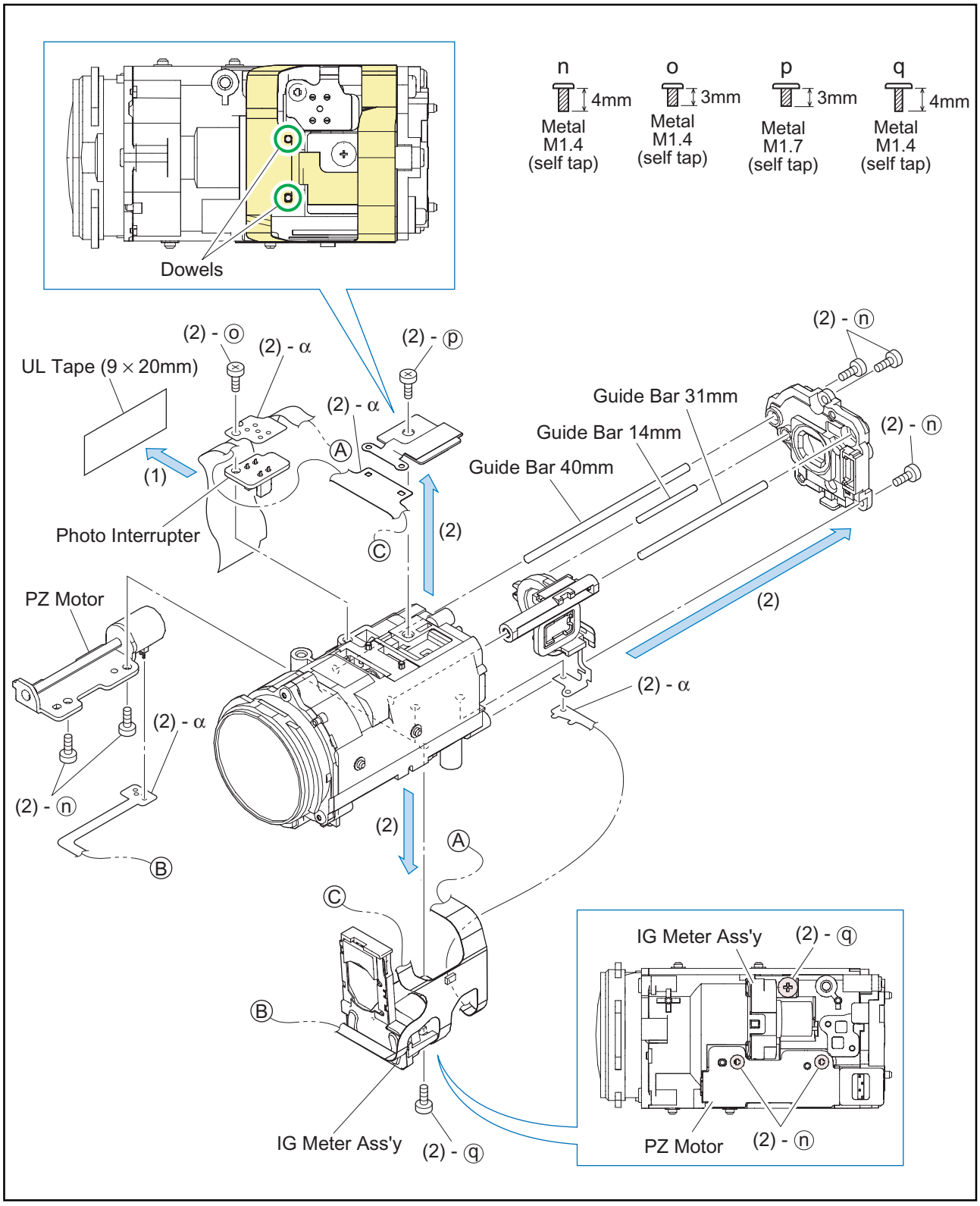


Fig. 51

<Note on Reassembling>

(1) After engaging the VCM FPC with the groove A and dowel B, provide soldering. Then, mount the IRIS MAIN FPC so that it is secured with the rib C of the CCD Holder.

(2) Attach the UL Tape to the position indicated in the figure below.

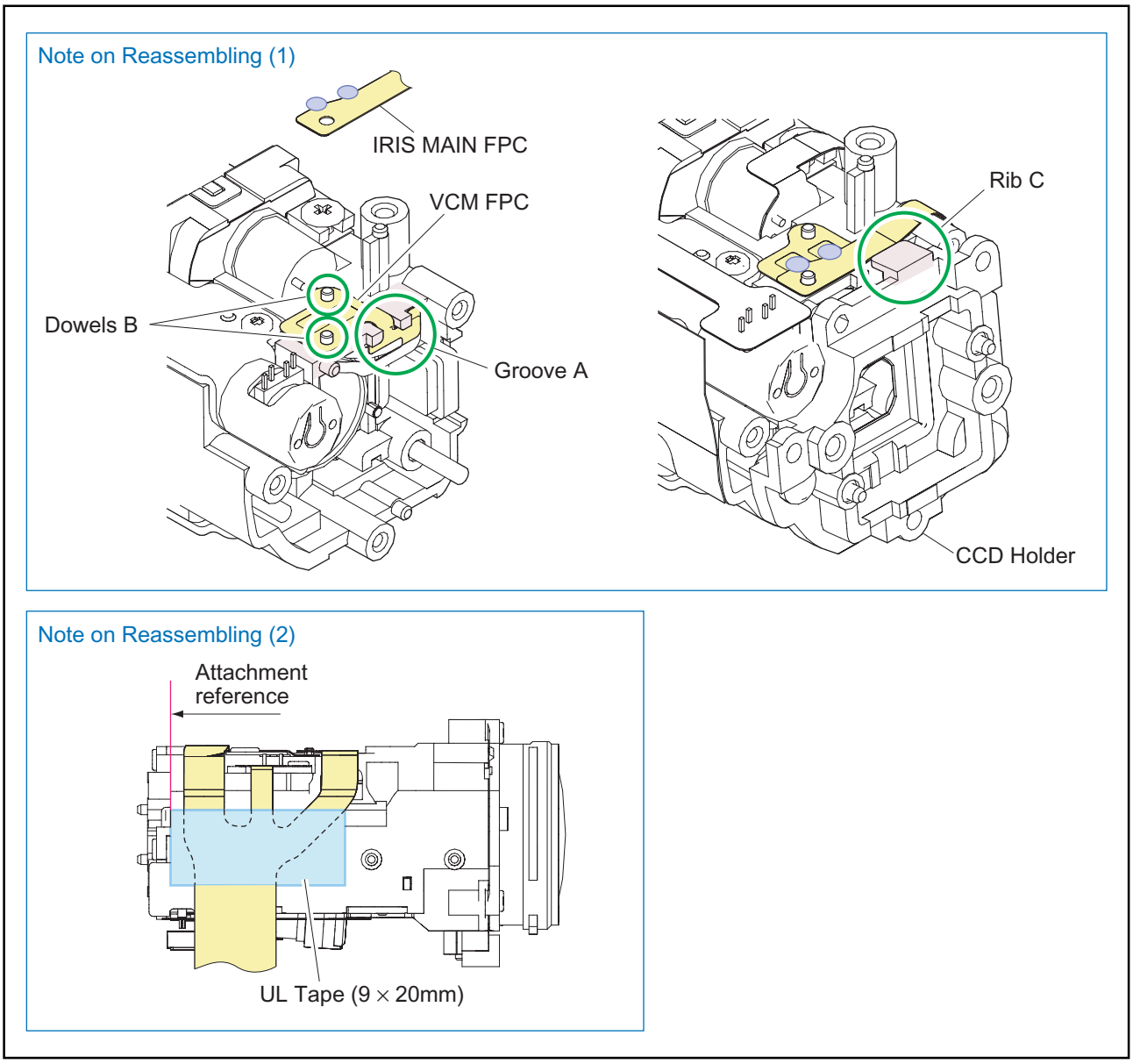
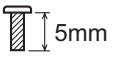
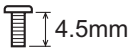
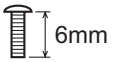
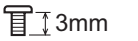
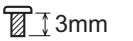
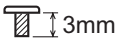
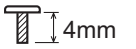
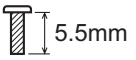
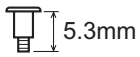
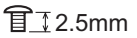
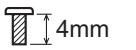
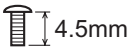
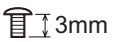
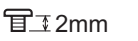
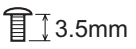
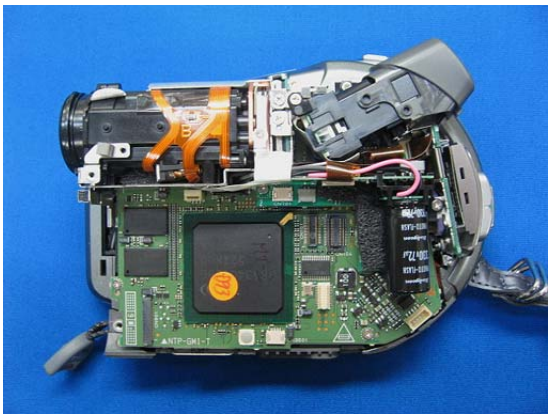


Fig. 52

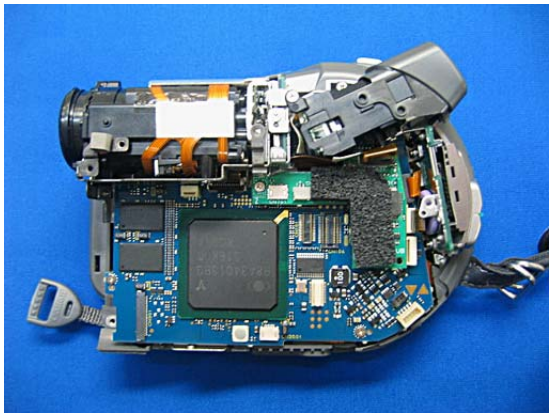
1-31 List of Screws Used

SYMBOL	PARTS NO.	REMARKS	ILLUST	SYMBOL	PARTS NO.	REMARKS	ILLUST
a	XA1-7170-257	M1.7-2.5mm（Metal）		l	XA4-9170-507	Self Tap M1.7-5.0mm（Metal）	
b	XA1-7170-457	M1.7-4.5mm（Metal）		m	XA1-7140-307	M1.4-3.0mm（Metal）	
c	XA9-1710-000	M1.7-6.0mm（Metal）		n	XA4-9140-407	Self Tap M1.4-4.0mm（Metal）	
d	XA1-7170-307	M1.7-3.0mm（Metal）		o	XA4-9140-307	Self Tap M1.4-3.0mm（Metal）	
e	XA1-7170-357	M1.7-3.5mm（Metal）		p	YB1-0405-000	Self Tap M1.7-3.0mm（Metal）	
f	XA4-9170-457	Self Tap M1.7-4.5mm（Metal）		q	YB1-0163-000	Self Tap M1.4-4.0mm（Metal）	
g	XA4-9170-557	Self Tap M1.7-5.5mm（Metal）		r	XA1-7140-257	M1.4-2.5mm（Metal）	
h	XA9-1700-000	Stepped Screw M1.7-5.3mm（Metal）		s	XA9-1705-000	M1.7-2.5mm（Metal）	
i	XA4-9170-407	Self Tap M1.7-4.0mm（Metal）		t	XA9-1709-000	M1.7-4.5mm（Metal）	
j	XA4-9170-359	Self Tap M1.7-3.5mm（Black）		u	XA9-1706-000	M1.7-3.0mm（Metal）	
k	XA1-7170-207	M1.7-2.0mm（Metal）		v	XA9-1707-000	M1.7-3.5mm（Metal）	

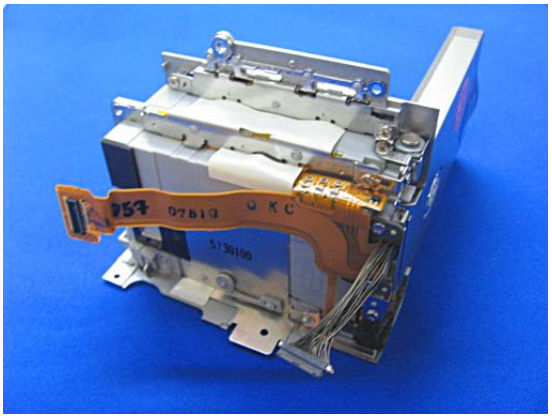
1-32 List of Disassembly Photos



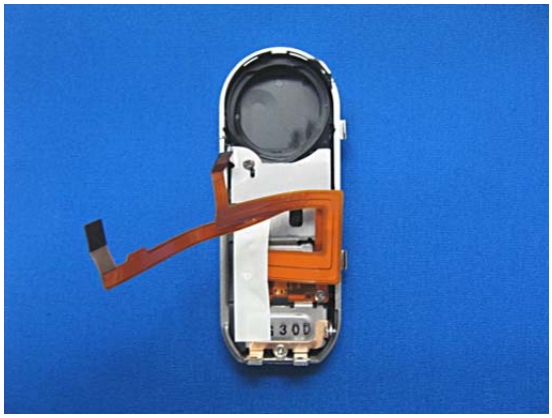
Right Side (DC20 E)



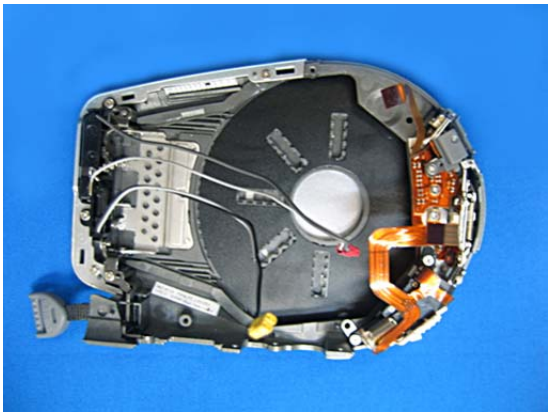
Right Side (DC10 E)



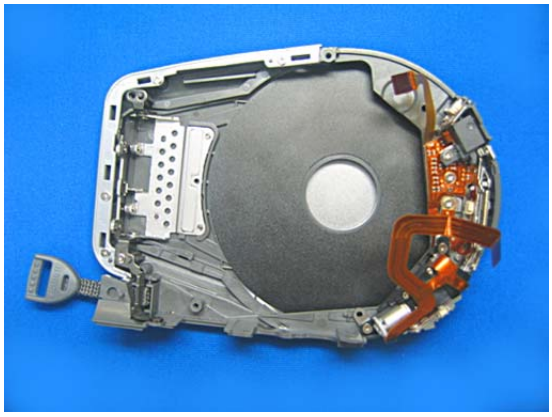
R-LCD Unit



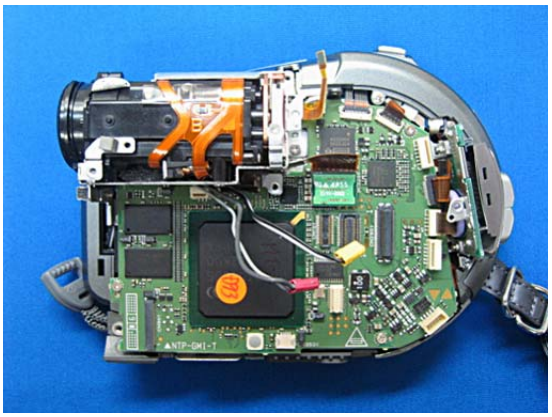
Front Cover Unit



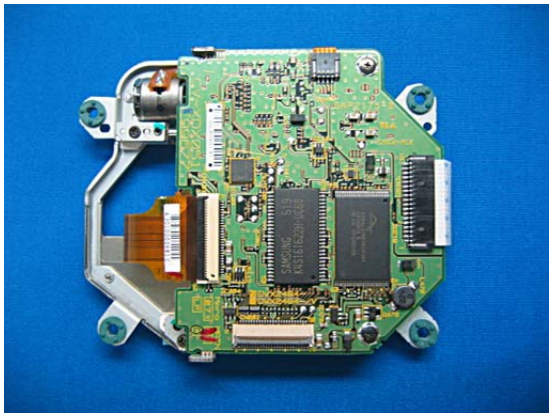
Left Cover Unit (DC20 E)



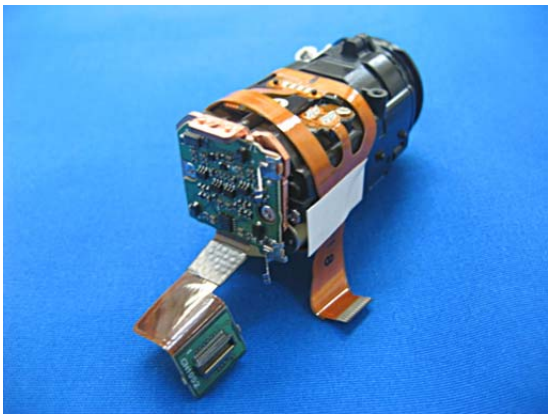
Left Cover Unit (DC10 E)



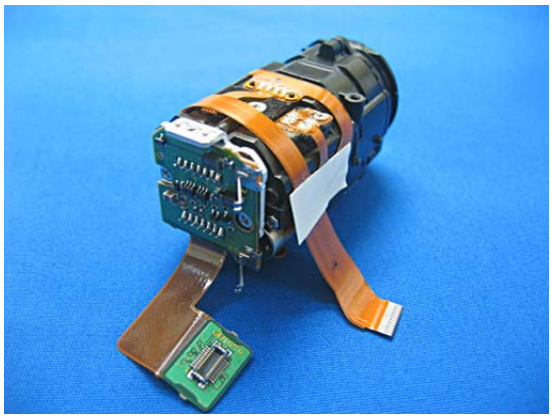
Camera Recorder Unit



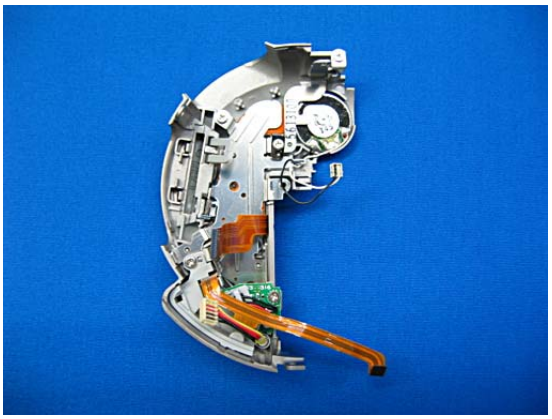
TS Mech Recorder Ass'y



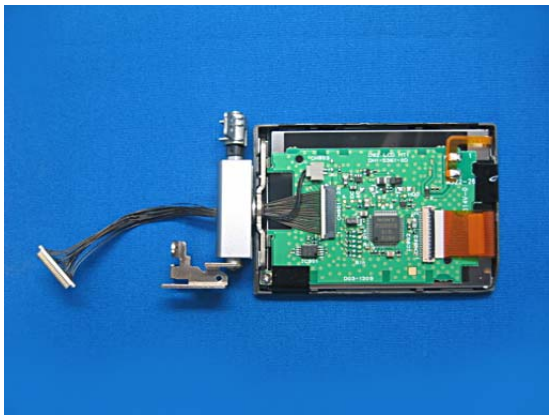
Camera Unit (DC20 E)



Camera Unit (DC10 E)



Rear Cover Unit



LCD Unit

SERVICE MODE / ADJUSTMENT

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1. Maintenance Tools

1-1 List of Maintenance Tools

Item Name	Item Number	Purpose	Remarks
Color bar chart	DY9-2002-000	Camera electrical adjustment	
Color Viewer 5600° K for 220V	DY9-2039-220	Camera electrical adjustment (for 220)	
Color Viewer 5600° K for 240V	DY9-2039-240	Camera electrical adjustment (for 240)	
Lamp for Color Viewer 5600K	DY9-2040-000	Replacement	
Filter, CCA W12ø46mm	DY9-2046-000	Camera electrical adjustment	
Card, Mini SD, Service Mode	DY9-1406-000	Service mode, electrical adjustment, check	With AD adapter
Extension connector (24pin)	DY9-1390-000	Test pin extended	
CCD image adjustment tool	DY9-1391-000	Camera electrical adjustment	
Mount, 27 mm	DY9-1403-000	Camera electrical adjustment	
DVD-R reference DISC (PAL)	DY9-1408-000	Playback error rate check	TS Mech
CCD image adjustment tool modification kit	DY9-1404-000	CCD image adjustment tool modification	

2. Setting

(1) Carry out all the adjustment and check procedures in the product state.

2-1 Using the Extension Connector

When performing CVF adjustment (optional adjustment item), use the extension connector (DY9-1390-000).
For standard adjustment items, the extension connector is not necessary.

(1) Detach the LID JIG CONNECTION.
(2) Connect the extension connector to the CN2900.

<Signals used>

Pin No.	Signal Designation	Pin No.	Signal Designation
3	GND	15	EVF G
4	EVF HD	16	EVF B
13	EVF R	18	EVF COM DC
14	EVF COM AC		

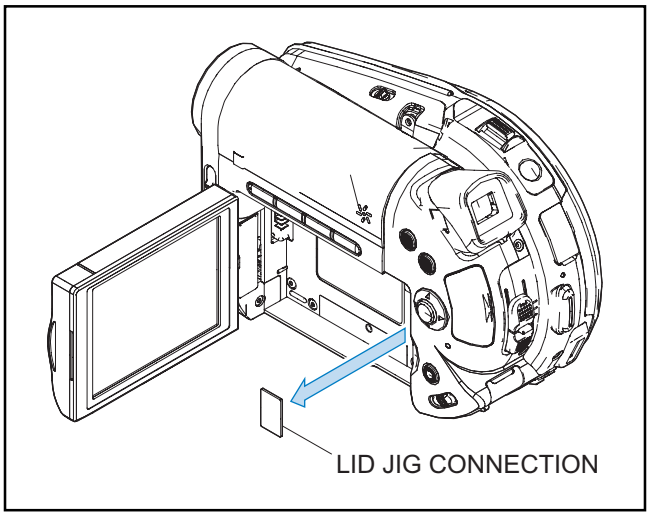

Fig. 1

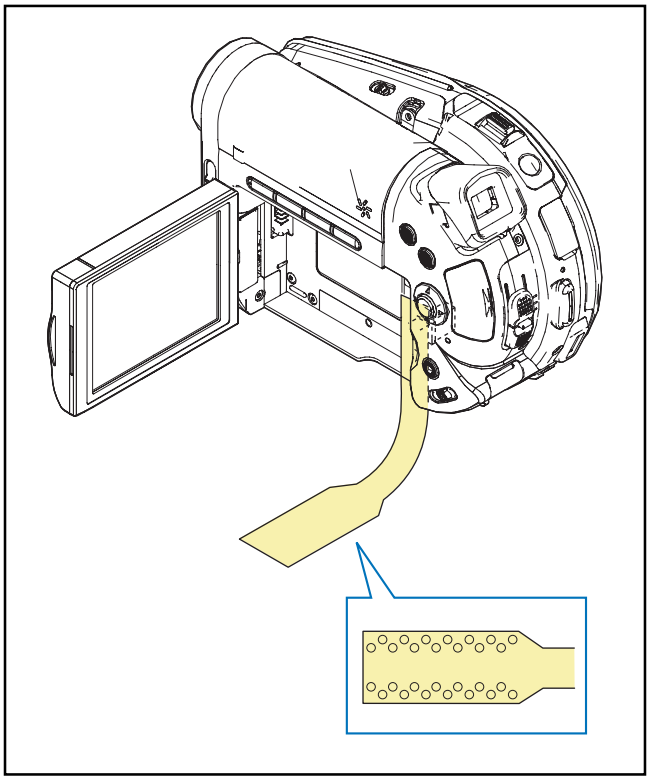

Fig. 2

3. Service Modes

3-1 Outline

(1) The service mode in this equipment uses the wireless remote controller. (To be used in remote control code 2)
 * The remote controller furnished with the instrument cannot transfer to the service mode. For this purpose, use the remote controller (ex. WL-D84) furnished with a conventional product.

(2) For changeover to the service mode, a dedicated tool (CARD, MINI SD, SERVICE MODE: DY9-1406-000) is required in addition to the wireless remote controller.

(3) Mode changeover is available between the service mode and the normal mode using the “Audio dubbing” and “SLOW” keys of the wireless remote controller.
As long as power is ON, the service mode is available even if the “CARD, MINI SD, SERVICE MODE” is removed.

(4) In the service mode, changeover of the main unit operation mode can be handle using the keys on the main unit and the attached remote controller, but the usable keys are restricted.

(5) In the service mode, safety function such as for low voltage detection is canceled.

(6) On the Index screen in the motion picture playback mode, it is not possible to changeover to the service mode due to the system mechanism. During playback, changeover to the service mode is available.

3-2 How to Change Over to Service Mode

(1) Set the Service Mode Card (DY9-1406-000) in the card slot on the equipment and change over to the camera mode.

(2) Press the "Dubbing" key on the wireless remote controller (WL-D84) that is set at Remote controller code 2.
 * To changeover to Remote controller code 2, press “Remote controller setting” and “Zoom T” keys simultaneously for 2 sec.

(3) Now the changeover to the service mode has been completed and the SERVICE MODE appears on the screen.

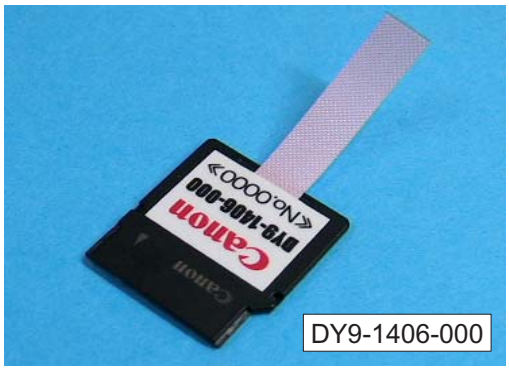

Fig. 3

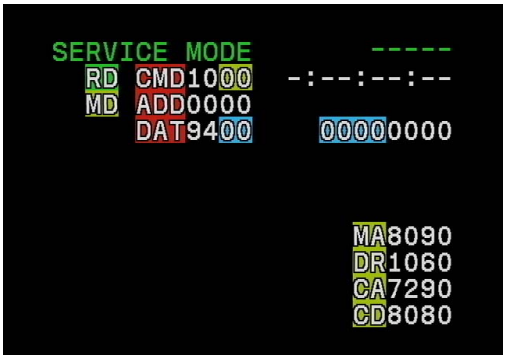

Fig. 4

 * Pressing the “SLOW” key performs the changeover to the normal mode from the service mode.
 As long as the power supply is ON, the service mode is available by setting the “Audio dubbing” key even if the Service Mode Card is removed.
 * After completion of repairing, press the Reset button to release the service mode completely.

3-3 How to Operate Wireless Remote Controller in Service Mode

(1) To use the wireless remote controller in the service mode, set it at Remote controller code 2.

* To changeover to Remote controller code 2, press the “Remote controller setting” and “Zoom T” keys simultaneously for 2 sec.
* The remote controller furnished with the instrument cannot transfer to the service mode. For this purpose, use the remote controller (ex. WL-D84) furnished with a conventional product.

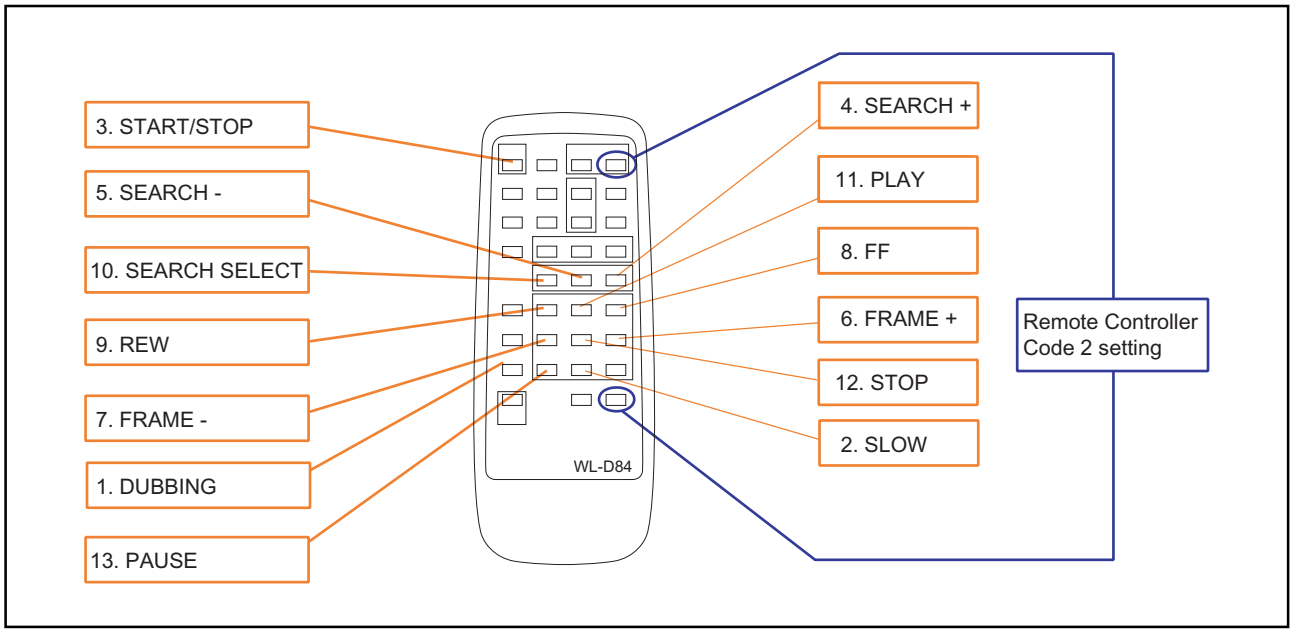

Fig. 5

No.	Key Designation (in Normal Mode)	Key Designation (in Service Mode)	Function
1	DUBBING	SERVICE MODE	Change over to service mode
2	SLOW	NORMAL MODE	Change over to normal mode
3	START/STOP	CS+	Increases CS by 1.
4	SEARCH +	FUNCTION +	Increases FUNCTION by 1.
5	SEARCH -	FUNCTION -	Decreases FUNCTION by 1.
6	FRAME +	HIGH ADDRESS +	Increases HIGH ADDRESS by 1.
7	FRAME -	HIGH ADDRESS -	Decreases HIGH ADDRESS by 1.
8	FF	ADDRESS +	Increases ADDRESS by 1.
9	REW	ADDRESS -	Decreases ADDRESS by 1.
10	SEARCH SELECT	MODE SELECT	Change over to RD/WR mode
11	PLAY	DATA +	Increases DATA by 1.
12	STOP	DATA -	Decreases DATA by 1.
13	PAUSE	STORE	Defines/writes DATA.

3-4 Indication in Service Mode

Shown below are the indications in the service mode.

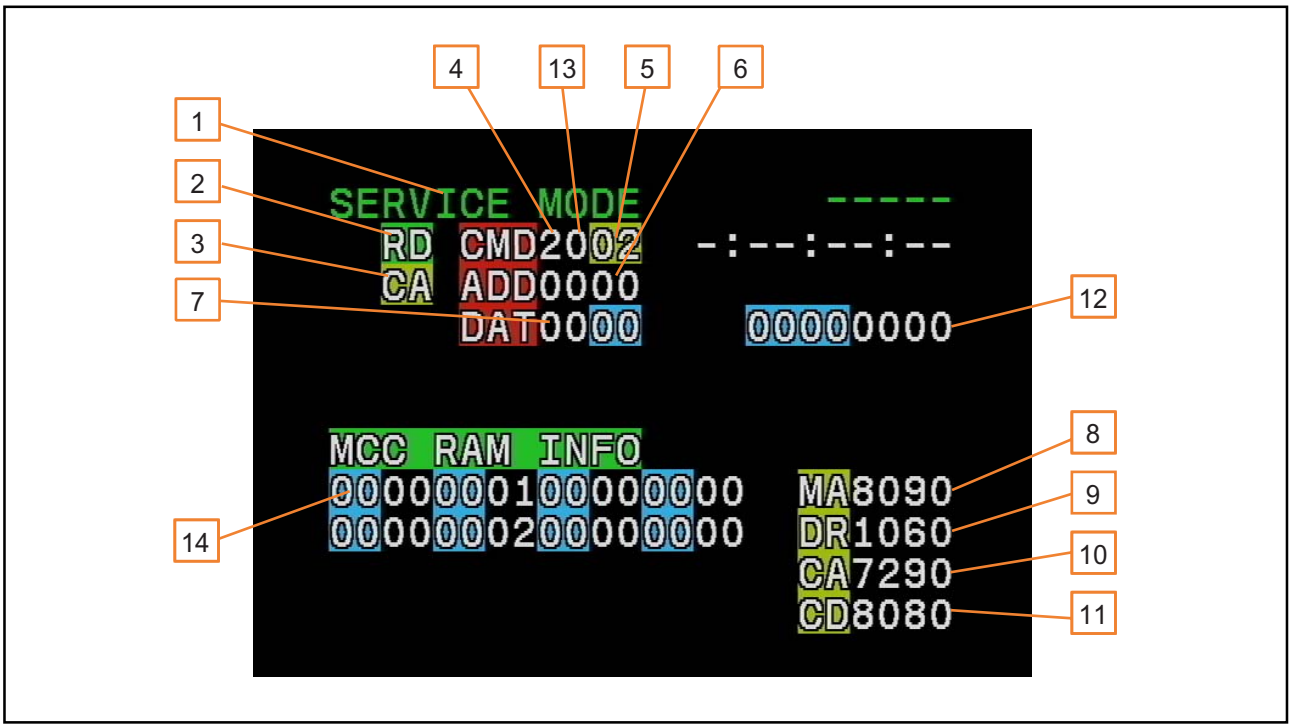

Fig. 6

1. Indicates that the service mode is currently selected. (“SERV”)
2. MODE : Indicates the MODE currently selected. (RD/WR/ST)
3. Indicates for which block the command is specified. (MA,MD, CA, CD, etc.)
4. CS : Indicates the Chip Select currently specified. (0~F)
5. Function : Indicates the Function currently selected. (00~FF)
6. ADDR : Indicates the ADDRESS currently selected. (0000~FFFF)
7. DT : Indicate, in hexadecimal representation, the DATA currently being read or set. (00~FF)
8. Indicates the version of the MAIN program in the BACK END MI-COM.
9. Indicates the version of the FRONT END.
10. Indicates the version of the CCM MI-COM.
11. Indicates the version of the flash memory program mounted outside the CCM MI-COM.
12. Indicates the error rate.
13. Data Write status (00: READ mode, 04 : Write preparation, OC : Write execution)
14. ST : Adjustment status (02: During adjustment, 05: OK in adjustment result, 09: NG in adjustment result)*

    * A numeric value to be indicated varies depending on the adjustment item concerned.

3-5 Service Mode Transition Card (DY9-1406-000)

Note)

(1) The Service Mode Card is applicable as a general-purpose mini SD card for the video camera (image writing/reading/erasing). No functional problem will occur in this application.
Note, however, that a trouble may take place if initialization is made by using the video camera/PC. Do not perform initialization with the video camera/PC.

(2) On the Service Mode Card, a tag and seal are attached for the purposes of discrimination from a general-purpose mini SD card and for prevention of unintentional disinstallation mistake. Therefore, a clearance in the card slot is somewhat smaller. When inserting/removing the service mode transition card, take care not to damage it.

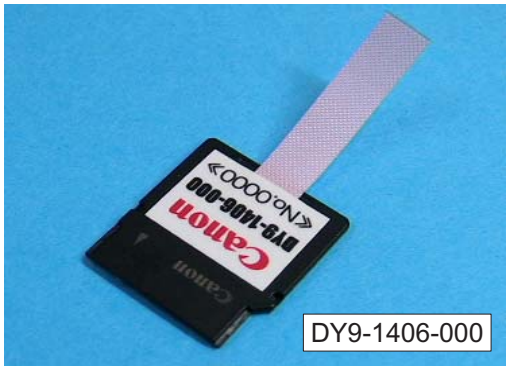

Fig. 7

4. Description of Service Modes

4-1 Error Rate

<Outline>

(1) An error rate is calculated from an error correction factor of digital data read out of the disc concerned. The playback performance can be checked of the sector corresponding to the calculated error rate.
(2) The error rate may vary depending on the disc condition, performance of pickup unit (tracking, focusing, laser), and performance of the RF circuit, etc.
(3) The lower the error rate gets, the better the playback performance gets.
Poor image quality Good image quality
$*.* \times 10^{-2}$ < $*.* \times 10^{-4}$

<How to output an error rate>

By the operation in step 1 below, an error rate can be output during playback.

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	ADDR	MODE	DT	
1	1) Make setting shown at right.	0	05	0001	ST	00→01	Product setting.
	2) Perform storing.	↑	↑	↑	RD	00	Error rate indication.
	(Press the PAUSE button.)						

* It takes 7 to 20 seconds to indicate an error rate, because it is calculated from large amount of data.
* To measure an error rate again, it is once required to stop the playback.
* Unlike measurements of DVCs, an audio-only error rate is not available.

<How to read an error rate>

Example) '0324' is indicated:
Error rate = 3.2×10^{-4}

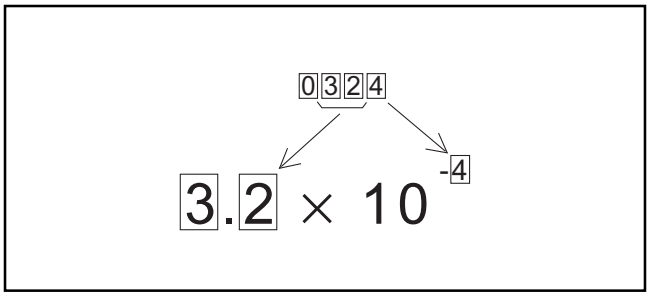

Fig. 8

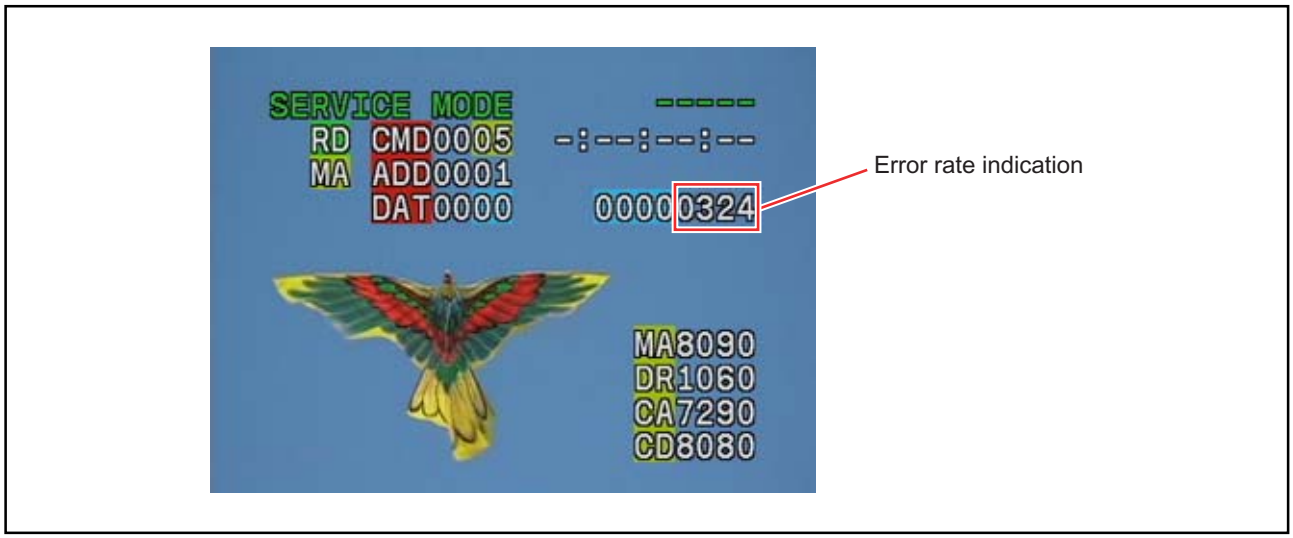

Fig. 9

4-2 Commands Particular to Camera

<Outline>

(1) The commands particular to camera are provided for checking the operation.
(2) Make preparation according to the table below and carry out the desired commands particular to camera.
(3) To restore any setting back to the original status, press the PAUSE key (STORE) for each item again in the “ST” mode. Turning the power OFF/ON resets all the settings.

STEP	PROCEDURE	MONITOR					Microcomputer operation
	CAM SPECIAL COMMAND	CS	Function	ADDR	MODE	DT	
WB SET	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3300 ↑	ST RD	-- --	WB is set.
WB LOCK	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3301 ↑	ST RD	-- --	WB is locked.
WB TURBO	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3302 ↑	ST RD	-- --	WB high-speed setting mode
WB OUTDOOR	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3303 ↑	ST RD	-- --	WB outdoor mode
WB INDOOR	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3304 ↑	ST RD	-- --	WB indoor mode
IRIS OPEN	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3305 ↑	ST RD	-- --	The iris is opened forcibly.
IRIS CLOSE	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3306 ↑	ST RD	-- --	The iris is closed forcibly.
AGC MAX	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3309 ↑	ST RD	-- --	A value of AGC gain is maximized.
AGC MIN	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	330A ↑	ST RD	-- --	A value of AGC gain is minimized.
COLOR BAR	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	330B ↑	ST RD	-- --	Outputs color bar from DIGIC DV.
White 100%	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	330C ↑	ST RD	-- --	Outputs white 100% from DIGIC DV.
White 50%	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	330D ↑	ST RD	-- --	Outputs white 50% from DIGIC DV.
BLACK & WHITE	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	330F ↑	ST RD	-- --	Outputs white & black chart from DIGIC DV.
GRAY SCALE	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	3310 ↑	ST RD	-- --	Outputs gray scale from DIGIC DV.
WHITE LED ON	1) Make setting shown at right. 2) Perform storing. (Press the PAUSE button.)	2 ↑	08 ↑	331F ↑	ST RD	-- --	Force the white LED to light.

4-3 Checking the Lens Resetting

<Outline>

(1) Set up addresses according to the table shown below. Thus, using data marked with the arrows in the figure below, you can check whether lens resetting has been completed or not.

* In case of 40 or 44, the zoom lens has not yet been reset.
* In case of 80 or 84, the focus lens has not yet been reset.
* In case of D4, the zoom lens and focus lens has been completion.

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	ADDR	MODE	DT	
1	1) Make setting shown at right.	2	08	312E	RD	--	RAM data indication

Fig. 10

4-4 Functional Check of Control Keys and Switches

<Outline>

(1) The CCM and SUB MI-COM terminals can be checked in the service mode. With this function, the key-related operations and the connections between the keys and the MI-COM terminals can be checked in the product state.

(2) Perform the check in the RD mode.

4-4-1 CCM MI-COM Input Port

PIN	NAME	Description	CS	Function	ADDR	DATA BIT	Description
E13	CARD DET	Detection memory card loading	1	01	0014	5	"L" for memory card loading
U13	START STOP	Start / Stop SW	1	01	000E	4	"L" at the ON time
T13	Half Photo Switch	Halfway pressing of Photo SW	1	01	000E	5	"L" at the ON time
R13	Photo Switch	Full pressing of Photo SW	1	01	000E	6	"L" at the ON time

4-4-2 CCM MI-COM A/D Port

PIN	NAME	Description	CS	Function	ADDR	AD DATA (00∼FF) Low High
C6	KEY AD3	KEY AD 3	1	02	0005	UP(00) DOWN(40) SET(80) MENU(C0)
B6	KEY AD2	KEY AD 2	1	02	0004	RIGHT(00) LEFT (40) PRINT(80) FUNC(C0)
A6	KEY AD1	KEY AD 1	1	02	0003	REW (00) FINAL(40) B.L (80) W.TV(C0)
C5	KEY AD0	KEY AD 0	1	02	0002	STOP (00) PLAY (40) FF (80) DISP(C0)
E8	ZOOM KEY	Zoom key output	1	02	0016	WIDE CENTER TELE
A8	I ENC	IRIS ENC output	1	02	0014	Small diaphragm Open
B7	Y GYRO	Yaw GYRO output	1	02	0011	
A6	P GYRO	Pith GYRO output	1	02	0010	
C3	MODE DIAL 1	AE Mode (SCN)	1	02	000A	SCN (00)
A4	MODE DIAL 0	AE Mode (P)	1	02	000B	P (00)

4-4-3 SUB MI-COM Input Port

PIN	NAME	Description	CS	Function	ADDR	DATA BIT	Description
21	Movie/Still SW	Movie/Still SW	1	1E	0005	4	"H" at Movie
12	DC J DET	DC JACK detection	1	1E	0004	2	"H" at the setting
20	Eject Switch	EJECT SW detection	1	1E	0005	5	"L" at the ON time
25	Li3V Detect	Detection of decrease in lithium battery voltage	1	1E	0004	1	"L" at thedecrease
32	CAM Power Switch	POWER SW detection	1	1E	0006	7	"L" at the ON time
33	Power Switch	POWER SW detection	1	1E	0006	6	"L" at the ON time

4-4-4 SUB MI-COM A/D Port

PIN	NAME	Description	CS	Function	ADDR	AD DATA (00∼FF) Low	High
27	Batt Info A/D	Battery Temperature Detection	1	1E	0001	High(FF)	Low(00)
26	Batt A/D	Battery Voltage Detection	1	1E	0000	Low(00)	High(FF)

4-4-5 BACK END MI-COM Input Port

PIN	NAME	Description	CS	Function	ADDR	DATA BIT	DESCRIPTION
T3	AV DET	Multi terminal connection detect	0	01	000B	5	"H" at detect
T5	PANEL Open Switch	LCD open detect	0	01	000A	2	"H" at the open

5. Adjustment Procedures

5-1 Adjustment Items in Part Replacement

After replacement of major parts, carry out adjustment referring to the table shown below. Note that the following table shows minimum required adjustments to be performed after replacing any major part. In case that two or more parts have been replaced or any faulty condition has occurred, take a proper adjustment procedure accordingly.

NOTE)

(1) Before turning on power to the main unit, prepare the tools necessary for a series of adjustment steps and make setting as required. Thus, you can perform the adjustment items in succession without having to make preparation before each adjustment item.
(2) After turning on power to the main unit, carry out the adjustment items in the order indicated in the Service Manual. Accomplish the adjustment items successively wherever possible.
(3) Regarding item 5-5 "CCD Section (2)", determine a timing point of execution with priority given to the internal camera temperature (for details, refer to the description of internal camera temperature check). Note, however, that 5-6 "Camera Section" should be taken after carrying out item 5-5 "CCD Section (2)". (Item 5-5 may be carried out before items 5-3 and 5-4.)

○ : Adjustment required

Camera system							
No.	Adjustment item	Part name					Adjustment setting
		Lens	GYRO PCB	CCD PCB	MAIN PCB		
5-2 CCD Section (1) (DC20 E only)							
5-2-1	Internal Camera Temperature Check (1)			○	○		Product condition
5-2-2	Iris Adjustment (Coarse Adjustment)			○	○		Product condition
5-2-3	Preparation for CCD Image Adjustment (1)			○	○		Product condition
5-2-4	Preparation for CCD Image Adjustment (2)			○	○		Product condition
5-2-5	Internal Camera Temperature Check (2)			○	○		Product condition
5-2-6	CCD Image Adjustment (Low Temperature)			○	○		Product condition
5-2-7	CCD Image Adjustment Result Check (Low Temperature)			○	○		Product condition
5-3 AF Section							
5-3-1	VCM Adjustment	○		○	○		Product condition
5-3-2	CZ Automatic Adjustment	○		○	○		Product condition
5-3-3	Cam Correction (AUTO)	○		○	○		Product condition
5-4 IS Section							
5-4-1	Gyro Offset Auto Adjustment		○		○		Product condition
5-4-2	Data Writing		○		○		Product condition
5-5 CCD Section (2) (DC20 E only)							
5-5-1	Internal Camera Temperature Check (3)			○	○		Product condition
5-5-2	CCD Image Adjustment (High Temperature)			○	○		Product condition
5-5-3	CCD Image Adjustment Result Check			○	○		Product condition

◯ : Adjustment required

Camera system

No.	Adjustment item	Part name					Adjustment setting
		Lens	GYRO PCB	CCD PCB	MAIN PCB		
5-6 Camera Section							
5-6-1	Iris Adjustment	◯		◯	◯		Product condition
5-6-2	WB Adjustment (1)	◯		◯	◯		Product condition
5-6-3	Color Balance Adjustment	◯		◯	◯		Product condition
5-6-4	WB Adjustment (2)	◯		◯	◯		Product condition
5-6-5	WB Adjustment (3)	◯		◯	◯		Product condition
5-6-6	DATA Writing	◯		◯	◯		Product condition
5-6-7	CCD Pixel Missing Compensation			◯	◯		Product condition

Recorder system

No.	Adjustment item	Part name					Adjustment setting
		MAIN PCB	TS mech chassis	LCD PCB			
5-7 Recorder Section							
5-7-1	Playback error rate check	◯	◯				Product condition
5-7-2	Self-recording error rate check	◯	◯				Product condition
5-7-3	LCD PCB Setting Destination			◯			Product condition

5-2 CCD Section (1) - CCD Image Adjustment - (DC20 E only)

This camcorder is provided with a primary-color-filter CCD having 2,000,000 pixels. Since the number of CCD pixels is increased, two signal processing circuits are provided for the left-side and right-side imaging areas. For eliminating a level difference between signals on these two signal processing circuits, it is required to perform initial adjustment using a dedicated tool. The characteristics of the CCD (sensitivity, void/stuck pixels) largely depend on its temperature, and there are subtle differences in the CCD characteristics due to variations in production. Therefore, carry out CCD image adjustment twice in total, i.e., at low temperature (immediately after power-on) and at high temperature (in a lapse of certain time after power-on).

Note)

For CCD image adjustment of this camcorder, it is required to modify the CCD image adjusting tool DY9-1391-000 using the CCD image adjusting tool modification kit DY9-1404-000.

5-2-1 Internal Camera Temperature Check (1)

Preparation)

(1) Connect the CCD image adjusting jig as shown in Fig. 11. (The LED light source should be removed until item 5-2-3.)
In this video camera, turn the TAPE/DISC select switch to DISC position.

(2) Before proceeding to adjustment, apply power to the CCD image adjusting tool for at least 15 minutes (in order to stabilize the light source).

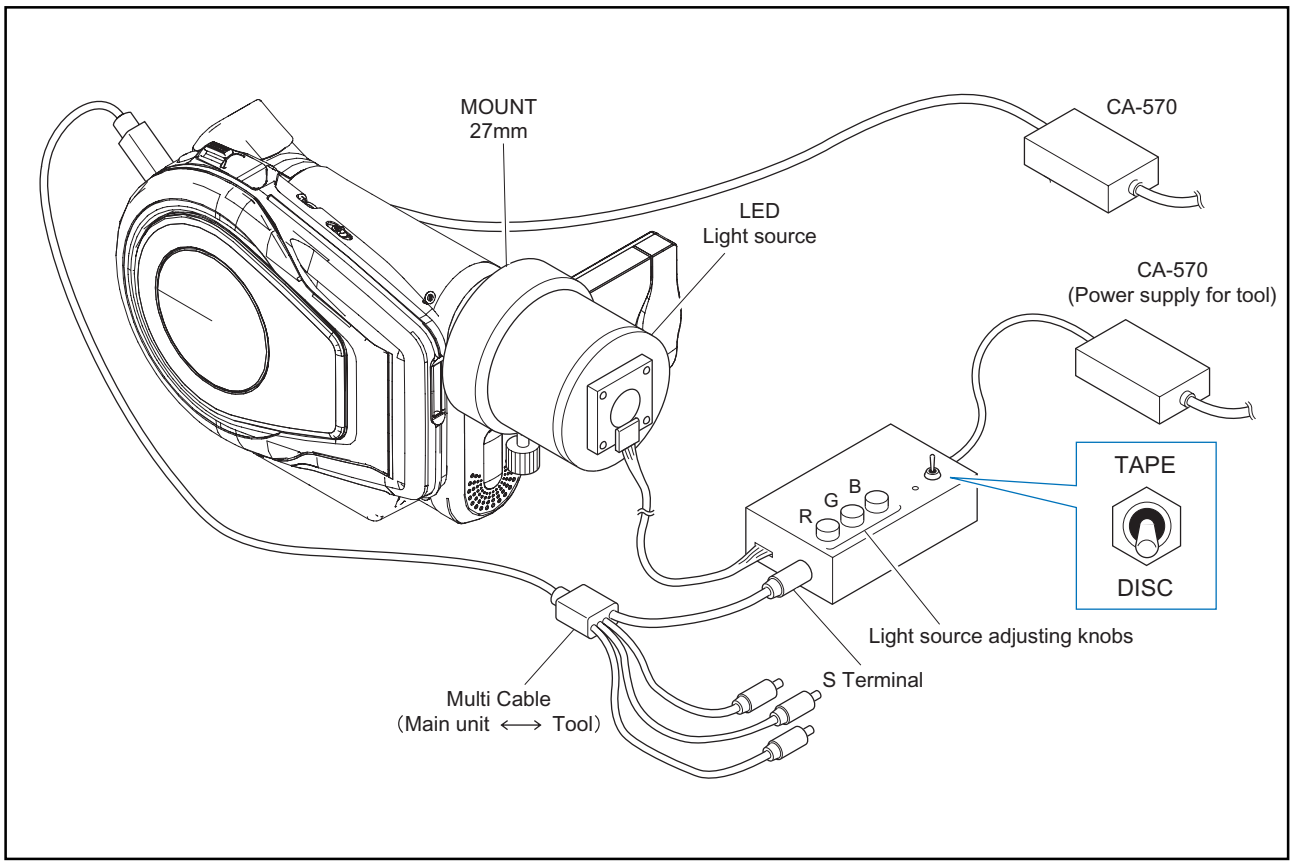

Fig. 11

Procedure)

(1) Referring to the table shown below, check the internal temperature sensor in the camera.
(Be sure to perform this step immediately after power-on.)

(2) Using the internal camera temperature data, and record the current internal temperature.
Temperature immediately after power-on T1 = _____

Note)

(1) In cases where the procedure has been interrupted, the internal camera temperature data recorded will be usable as reference data at the time of restart.

STEP	PROCEDURE TEMPERATURE CHECK	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	02 ↑	ST RD	00D0 ↑	08 ↑	Completion of internal camera temperature sensor check indication. Adjustment is completed.
2	Press SLOW KEY for transition to the normal mode.						Indication of internal camera temperature

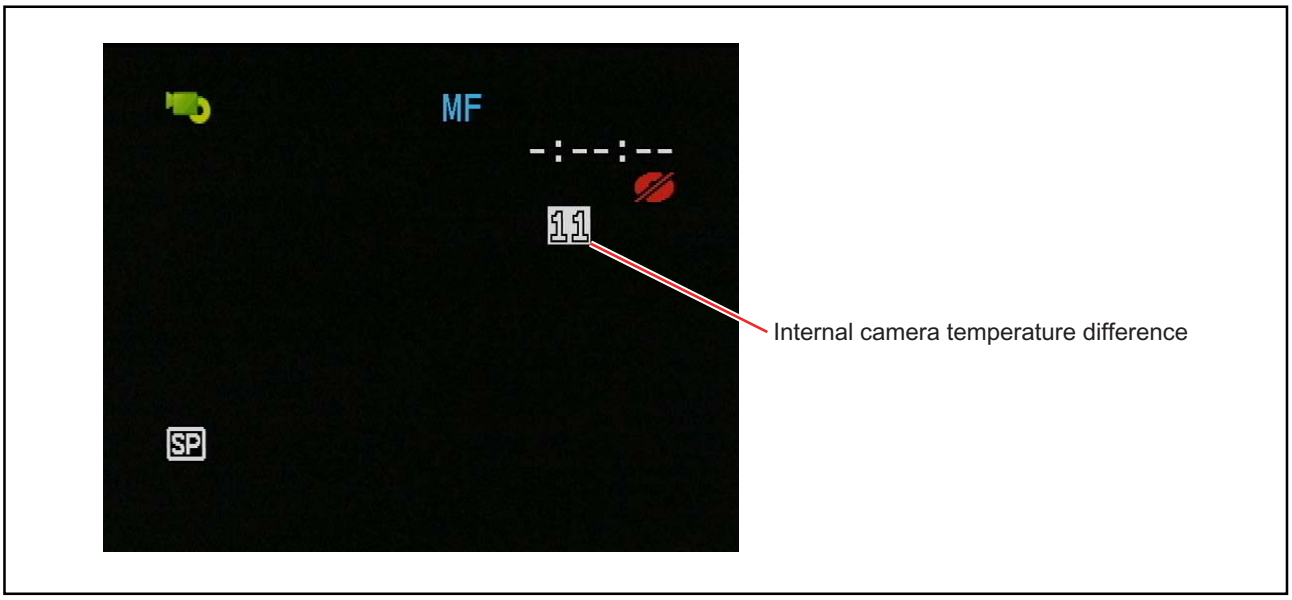

Fig. 12

- Internal camera temperature difference T [°C] = (Current internal camera temperature) - (Internal camera temperature at CCD image adjustment (low temperature)
- The value of the internal camera temperature difference is represented in decimal notation. When the value is negative, it will blink. (The value does not blink if it is positive.)
- Changes in the internal camera temperature difference will cause the background color to change. As the internal temperature of the lens increases, the background color changes as follows: blinking in yellow→white→ yellow→green.

Note: Until CCD image adjustment is carried out at a service center, a value of internal camera temperature difference is indicated according to the "Internal camera temperature at CCD image adjustment (low temperature)" data recorded at the time of pre-adjustment in the manufacturing process.

5-2-2 Iris Adjustment (Coarse Adjustment)

(1) Adjustment Conditions

Movie/Still : Movie
Shooting mode : Program AE
AF : Closest MF focus
ZOOM : Telephoto-end
Electronic zoom : OFF
Image stabilizer : OFF

CHART	Not required
SPEC.	Automatic adjustment

Procedure)

(1) According to the table shown below, carry out iris adjustment (coarse adjustment).

STEP	PROCEDURE IRIS	MONITOR CS	Function	MD	ADDR	DT	Microcomputer operation
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3000 ↑	00 ↑	Iris adjustment. Adjustment is completed. Completion with ST:05, NG with ST:09
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3001 ↑	00 ↑	Writing of iris adjustment data Adjustment is completed. Completion with ST:05, NG with ST:09

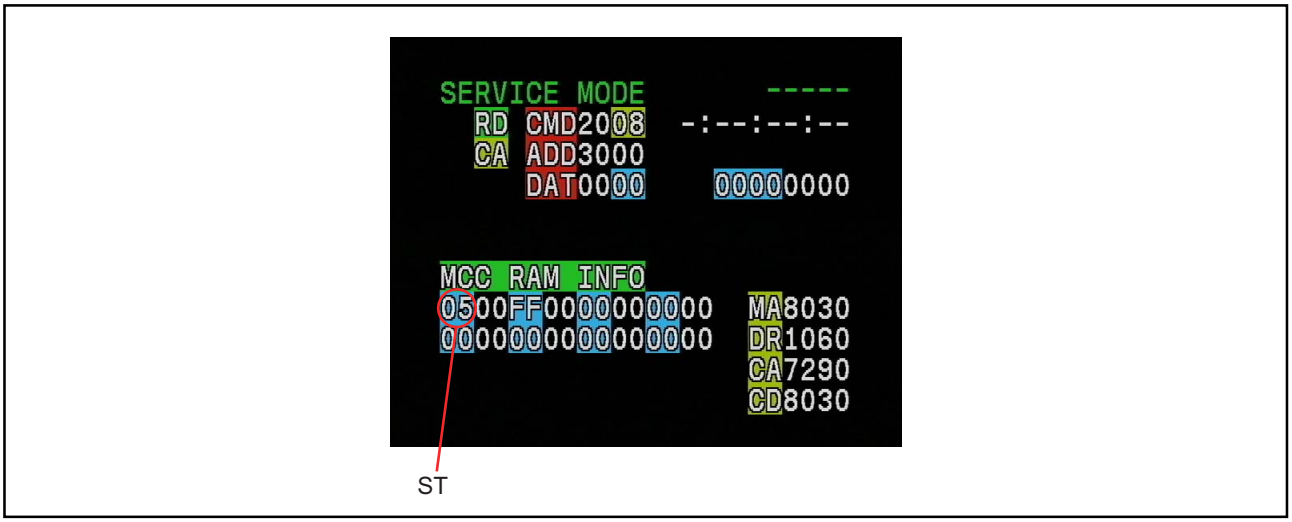

Fig. 13

5-2-3 Preparation for CCD Image Adjustment (1)

For this adjustment, use the same conditions as those specified in 5-2-2 Iris Adjustment (Coarse Adjustment)

SPEC. Manual adjustment

Preparation)

(1) On the CCD image adjusting tool, mount its light source part. Turn on power to the CCD image adjusting tool.

Procedure)

(1) According to the table shown below, adjust the light quantity of the CCD image adjusting tool.

STEP	PROCEDURE PREPARATION	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	7 ↑	ST RD	0000 ↑	01 01	 V synchronization set (DT becomes 00 after storing.)
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	301A ↑	01 ↑	Tool light intensity adjustment mode
3	Turn the light intensity adjusting knob of the tool so that each of the R, G and B data shown in Figure 14 will be 80±10.						
4	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	301A ↑	00 ↑	Move to normal mode.

Note)

If step 1 is not taken, the result of CCD image adjustment may become NG. To avoid this, be sure to carry out step 1.

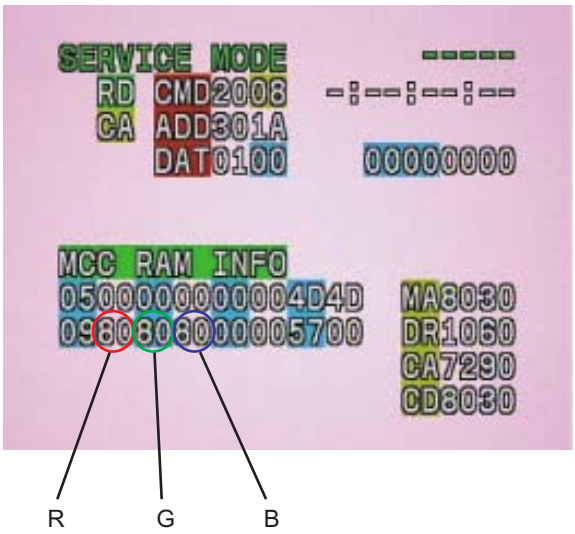

Fig. 14

5-2-4 Preparation for CCD Image Adjustment (2)

For this adjustment, use the same conditions as those specified in 5-2-2 Iris Adjustment (Coarse Adjustment)

(1) Be sure to take the correct sequence of procedural steps in CCD image adjustment. If you take any procedural step in an unspecified sequence or skip it over, normal adjustment will not be accomplished.

Procedure)

(1) According to the table shown below, check the light source of the CCD image adjusting tool.

STEP	PROCEDURE	MONITOR					Microcomputer operation
	LIGHT SOURCE CHECK	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3011 ↑	-- ↑	LED light source (LED RGB) check (1) Adjustment is completed. Completion with ST:05, NG with ST:09
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3012 ↑	-- ↑	LED light source (LED Flatness) check (2) Adjustment is completed. Completion with ST:05, NG with ST:09

5-2-5 Internal Camera Temperature Check (2)

For this adjustment, use the same conditions as those specified in 5-2-2 Iris Adjustment (Coarse Adjustment)

Procedure)

(1) Press the SLOW KEY, check the internal temperature sensor in the camera.
(Within about five minutes, perform this step as soon as power is turned on.)

(2) Record the current internal temperature.
Temperature about five minutes after power-on T2 = _____

(3) Calculate an increase in the internal camera temperature [°C], and check that it is less than 7 [°C].
Increase in internal camera temperature [°C] = T2 - T1 Example: Under the condition that T1 = -9 and T2 = -4, an increase in temperature is calculated as follows: T2 - T1 = - 4 - (-9) = 5 [°C]

(4) If an increase in the internal camera temperature exceeds 7°C, turn power off and then wait until a temperature level of less than 7°C is reached. Then, proceed to items 5-2-6 and subsequent.

Note) Remember that power cannot be disconnected just by turning off the POWER switch. Be sure to release the service mode, and then turn off the POWER switch or unplug from the CA receptacle.

<Reference>

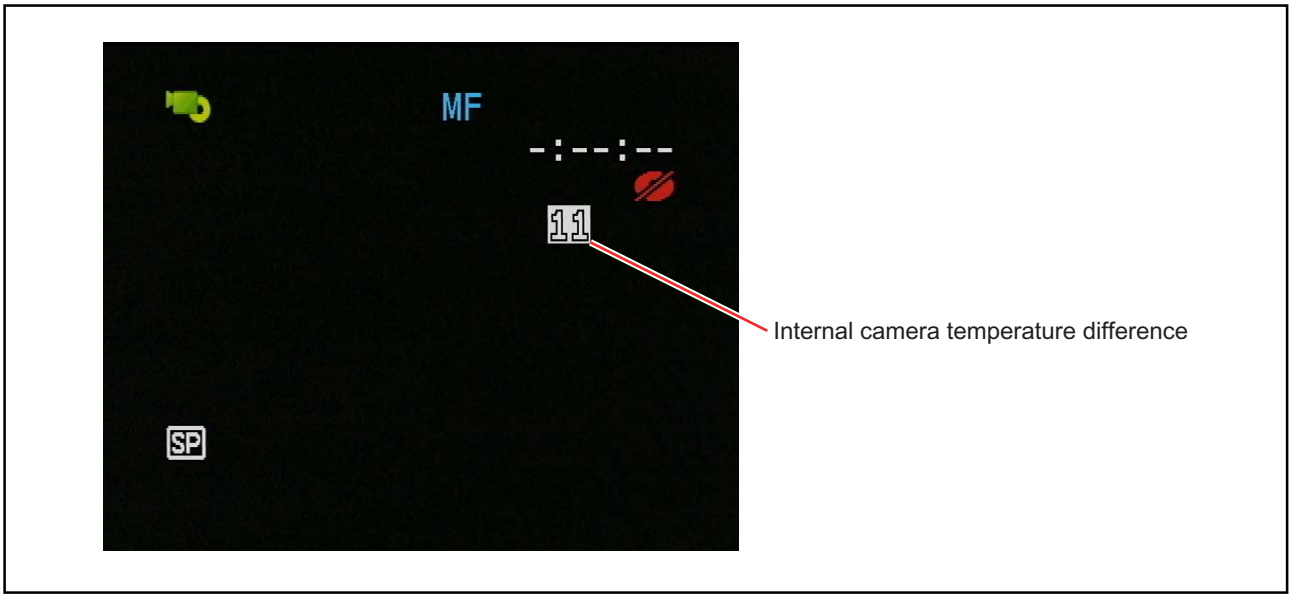

Fig. 15

- Internal camera temperature difference T [°C] = (Current internal camera temperature) - (Internal camera temperature at CCD image adjustment (low temperature)
- A value of internal camera temperature difference is represented in decimal notation. When the value is negative, it is indicated in blinking form. (When the value is positive, it is indicated in steadily turned-on form.)

5-2-6 CCD Image Adjustment (Low Temperature)

For this adjustment, use the same conditions as those specified in 5-2-2 Iris Adjustment (Coarse Adjustment)

SPEC. Automatic writing

Procedure)

(1) Carry out CCD image adjustment (low temperature) in the following procedure.

STEP	PROCEDURE CCD IMAGE ADJUSTMENT	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3013 ↑	-- ↑	Image adjustment (low temperature) Adjustment is completed. Completion with ST:05, NG with ST:09
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3014 ↑	-- ↑	Adjustment data writing. Adjustment is completed. Completion with ST:05, NG with ST:09

5-2-7 CCD Image Adjustment Result Check (Low Temperature)

For this adjustment, use the same conditions as those specified in 5-2-2 Iris Adjustment (Coarse Adjustment)

SPEC. Automatic writing

Procedure)

(1) Check and write the result data of CCD image adjustment.

STEP	PROCEDURE RESULT CHECK	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3017 ↑	-- ↑	Color difference check Adjustment is completed. Completion with ST:05, NG with ST:09
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3018 ↑	-- ↑	Noise check Adjustment is completed. Completion with ST:05, NG with ST:09
3	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3019 ↑	-- ↑	Check result writing Adjustment is completed. Completion with ST:05, NG with ST:09

Note)

If the result of any one of the above check steps is NG, carry out the adjustment procedures described in item 5-2 “CCD Section (1)” again from the beginning while maintaining the internal camera temperature within the allowable range. If NG is indicated repeatedly, replace the CCD PCB with a new one.

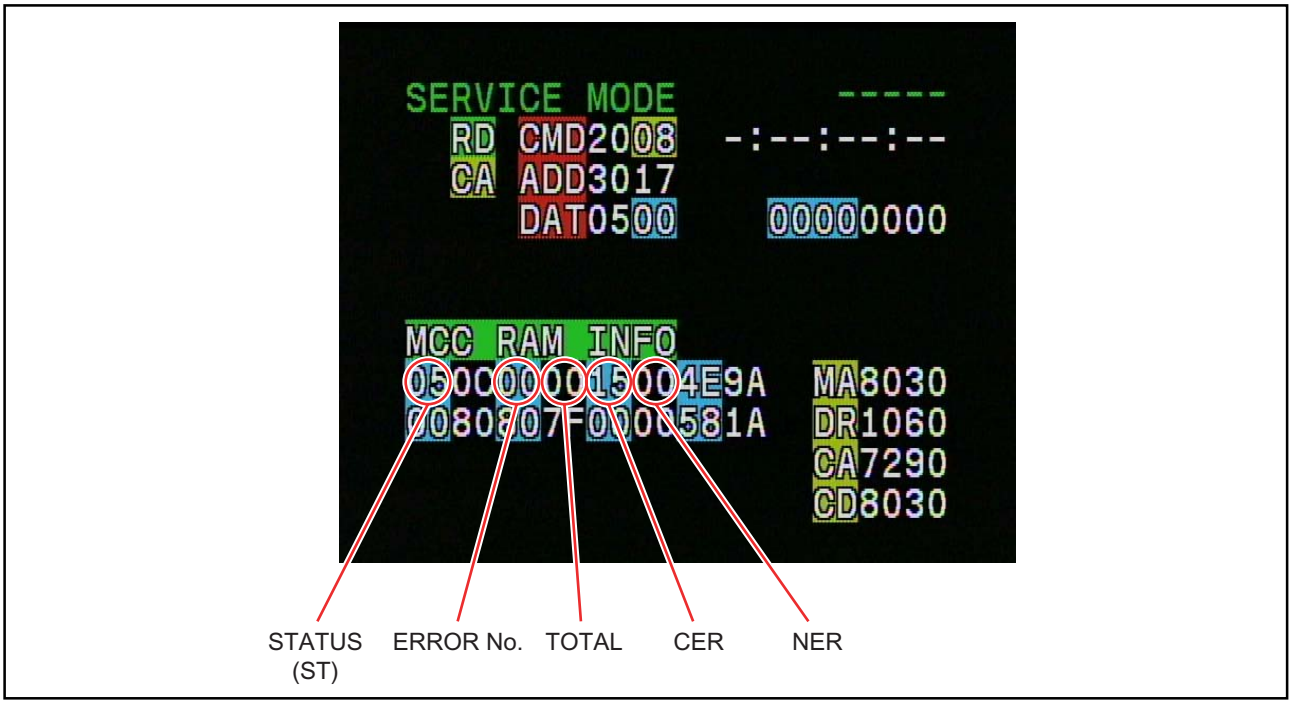

Fig. 16

Note)

For details of the error codes, refer to p.30.

5-3 AF Section Adjustment

Note)

(1) The sections 5-3-2 : CZ automatic adjustment and 5-3-3 : Cam correction (AUTO) must be executed consecutively. If they are performed independently, the sufficient performance cannot be obtained.
Also, when section 5-3-2 : CZ automatic adjustment is completed, execute section 5-3-3 : Cam correction (AUTO) must be executed immediately without elapse of time. If section 5-3-3 : Cam correction (AUTO) is executed after elapse of time upon completion of section 5-3-2 : CZ automatic adjustment, the sufficient performance cannot be obtained.

Preparation)

(1) For AF section Adjustment, use the product state.
(2) CZ adjustment and cam correction conditions (initial state)

Movie/Still	: Movie
Shooting mode	: Program AE
ZOOM	: Telephoto-end
CZ adjustment chart	: 2.4 ± 0.02 m from lens front
Chart luminance	: 500 lux or more (High illuminance should be avoided at the wide-angle end.)
Digital Zoom	: OFF
Auto slow shutter	: OFF

5-3-1 VCM Adjustment

SPEC. Automatic adjustment

Procedure)

(1) Referring to the table shown below, carry out VCM adjustment.

STEP	PROCEDURE	MONITOR					Microcomputer operation
	Preparation for VCM adjustment	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3119 ↑	00 ↑	 It will take a period of ten seconds OK with ST : 19
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	311A ↑	-- AA	 Correction value calculation. OK with ST : AA, NG with ST : FE

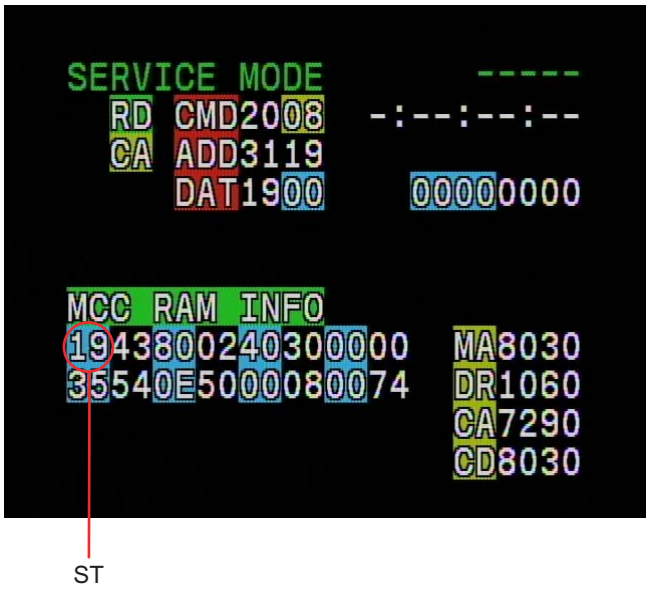

Fig. 17

5-3-2 CZ Automatic Adjustment

CHART CZ adjustment chart

SPEC. At STEP 3, ST : AA should be attained.

Procedure)

(1) In the telephoto-end setting, bring the center of chart image to the center of monitor TV.
(2) Referring to the table shown below, carry out CZ automatic adjustment in the service mode.
(3) Perform the cam correction.

STEP	PROCEDURE CZ	MONITOR CS	 Function	 MD	 ADDR	 DT	Microcomputer operation
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3110 ↑	00 10	 Move to adjustment mode.
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST ↑	3100 ↑	-- ↑	 Automatic adjustment is started. Then, it is completed in 30 seconds approximately. If any NG condition is encountered in automatic adjustment, check the parts inside the lens section.
3	Judgement on result of adjustment	2 ↑	08 ↑	RD RD	3100 ↑	AA FF	Adjustment is completed (ST=AA : OK). Perform the cam correction. Adjustment is completed (ST=FF : NG). Turn off the power then back on. Then make readjustment.

5-3-3 Cam Correction (AUTO)

CHART CZ adjustment chart

SPEC. Automatic adjustment

Procedure)

(1) Perform the cam correction by following the table below.
(2) Quit the service mode, turn power off/on, and then check that proper focusing can be attained in normal zooming operation (AF OFF).
(3) If the result is NG, perform 5-3-2 : CZ automatic adjustment and 5-3-3 : Cam correction (AUTO).

STEP	PROCEDURE CAM CORRECTION	MONITOR CS	 Function	 MD	 ADDR	 DT	Microcomputer operation
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3101 ↑	00 01	
2	Cancel the service mode, and set the zoom position to the telephoto end. After focus movement is stopped, turn OFF the AF function.						
3	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑ ↑	08 ↑ ↑	ST WR RD	3202 ↑ ↑	00 ↑ 02	 Correction value measurement. Completion with ST:02.
4	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3104 ↑	00 04	 Correction value calculation. Completion with ST:04.
5	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3105 ↑	00 AA	 Completion of correction value writing. Completion with ST:AA.

5-4 IS Section Adjustment

Note)

(1) Perform the IS adjustment after machine is re-assembled to a product status.
(2) Prepare a tripod or stable work bench.
(3) Each of the adjustment data (5-4-1) becomes valid when 5-4-2 data writing is made. After completion of each adjustment, be sure to carry out 5-4-2 before turning power OFF.

5-4-1 Gyro Offset Adjustment

SPEC. Automatic adjustment

Procedure)

(1) Wait at least 10 seconds while being careful not to apply vibration to the camera.
(2) Referring to the table shown below, perform the automatic adjustment.

Note)

It will take approx. 25 seconds at maximum to complete adjustment (OK) after storing (pressing the pause button).

STEP	PROCEDURE GYRO OFFSET	MONITOR						Microcomputer operation
		CS	Function	MD	ADDR	DT	ST	
1	1) Make the setting shown at right.	2	08	ST	320D	00		
	2) Perform storing. (press the PAUSE button.)	↑	↑	RD	↑		05	Adjustment is completed. Completion with ST:05, NG with ST:09 After adjustment, data is indicated at IS3 and IS4.

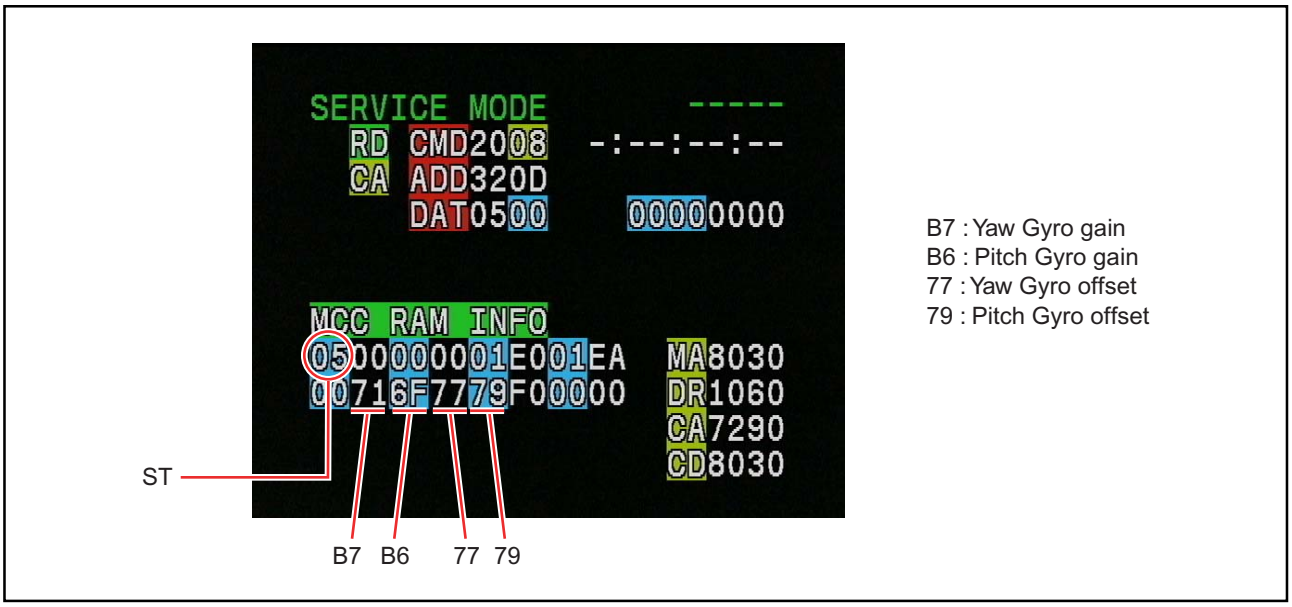

Fig. 18

5-4-2 Data Writing

SPEC. Automatic writing

Procedure)

(1) According to the table shown below, write adjustment data (5-4-1) into the flash memory.

STEP	PROCEDURE	MONITOR						Microcomputer operation
	DATA WRITING	CS	Function	MD	ADDR	DT	ST	
1	1) Make the setting shown at right.	2	08	ST	320F	00		
	2) Perform storing.	↑	↑	RD	↑		05	Completion of DATA writing.
	(press the PAUSE button.)							Completion with ST:05, NG with ST:09

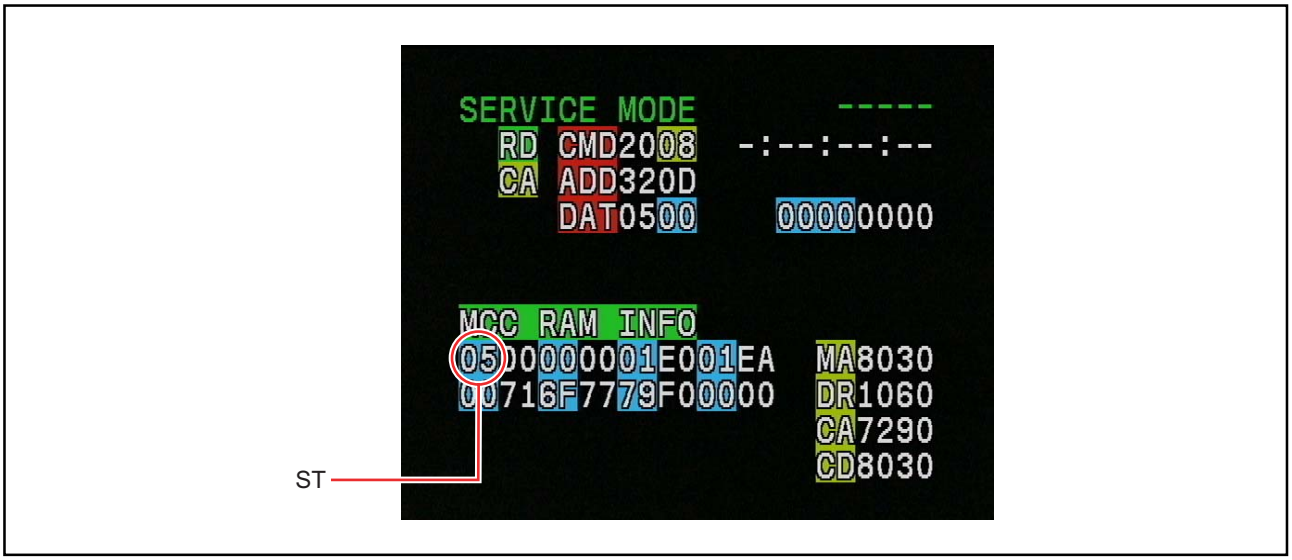

Fig. 19

5-5 CCD Section (2) (DC20 E only)

5-5-1 Internal Camera Temperature Check (3)

(1) Adjustment Conditions

Movie/Still	: Movie
Shotting mode	: Program AE
AF	: Closest focus
ZOOM	: Telephoto-end
Electronic zoom	: OFF
Image stabilizer	: OFF

Preparation)

(1) For adjustment, provide the same tool and connections as in 5-2 “CCD Section (1)”. (The LED light source should be removed until item 5-5-2.)

Procedure)

(1) Press the SLOW KEY, check the internal temperature sensor in the camera.
(Perform this step about 20 to 50 minutes after power-on.)

(2) Using the internal camera temperature data, calculate a value of the current internal temperature, and record the calculated value.
Temperature 20 to 50 minutes after power-on T3 = _____

(3) Calculate an increase in the internal camera temperature [°C], and check that it is in the range of 15[°C] to 20[°C].
Increase in internal camera temperature [°C] = (T2 - T1) + T3

(4) If an increase in the internal camera temperature exceeds 20°C, turn power off and then wait until a temperature level of less than 20°C is reached. Then, proceed to items 5-5-2 and subsequent.
If an increase in the internal camera temperature is less than 15°C, wait until a temperature level exceeding 15°C is reached. Then, proceed to items 5-5-2 and subsequent.

<Reference>

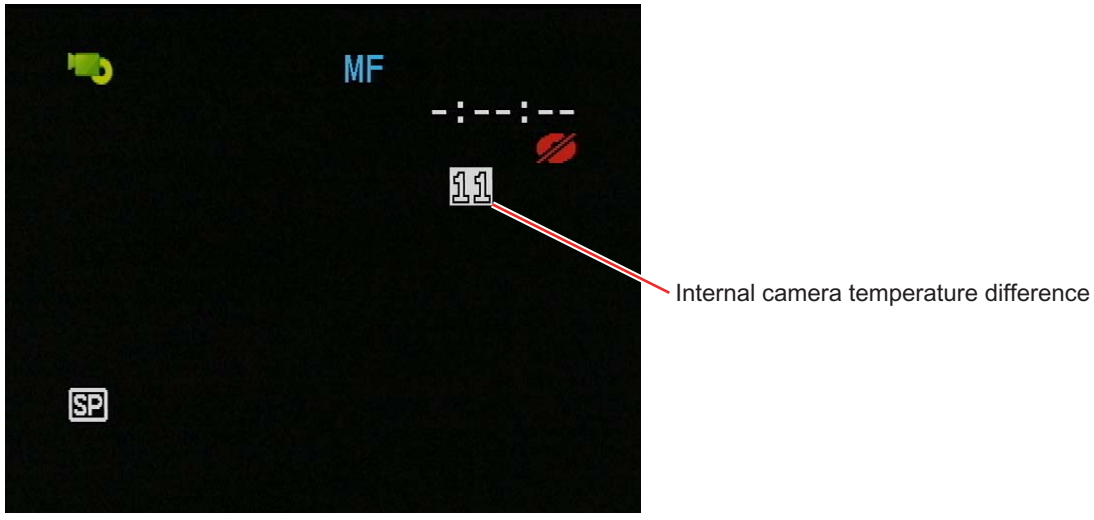

Fig. 20

Note)

The internal camera temperature check procedures are complete at this step. After checking the internal camera temperature difference, be sure to reset DATA to 00.

STEP	PROCEDURE	MONITOR					Microcomputer operation
	TEMPERATURE CHECK	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	02 ↑	ST RD	00D0 ↑	00 ↑	Release of internal camera temperature sensor check indication. Release is completed.
2	Press SLOW KEY for transition to the normal mode.						Indication of internal camera temperature

5-5-2 CCD Image Adjustment (High Temperature)

For this adjustment, use the same conditions as those specified in 5-5-1 Internal Camera Temperature Check (3)

SPEC. Automatic writing

Procedure)

(1) Carry out CCD image adjustment (high temperature) in the following procedure.

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	7 ↑	ST RD	0000 ↑	01 01	 V synchronization set (DT becomes 00 after storing.)
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3015 ↑	-- ↑	Image adjustment (high temperature) Adjustment is completed. Completion with ST:05, NG with ST:09
3	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3016 ↑	-- ↑	Writing of adjustment data Adjustment is completed. Completion with ST:05, NG with ST:09

Note)

- If the knob adjusted in 5-2-3 has been turned, readjust it before proceeding to CCD image adjustment (high temperature).
- If step 1 is not taken, the result of CCD image adjustment may become NG. To avoid this, be sure to carry out step 1.

5-5-3 CCD Image Adjustment Result Check

For this adjustment, use the same conditions as those specified in 5-5-1 Internal Camera Temperature Check (3)

SPEC. Automatic writing

Procedure)

(1) Check and write the result data of CCD image adjustment.

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3017 ↑	-- ↑	Color difference check Adjustment is completed. Completion with ST:05, NG with ST:09
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3018 ↑	-- ↑	Noise check Adjustment is completed. Completion with ST:05, NG with ST:09
3	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	3019 ↑	-- ↑	Check result writing Adjustment is completed. Completion with ST:05, NG with ST:09

Note)

If the result of any one of the above check steps is NG, carry out the adjustment procedures described in item 5-5 “CCD Section (2) (DC20 E only)” again from the beginning while maintaining the internal camera temperature within the allowable range. If NG is indicated repeatedly, replace the CCD PCB with a new one.

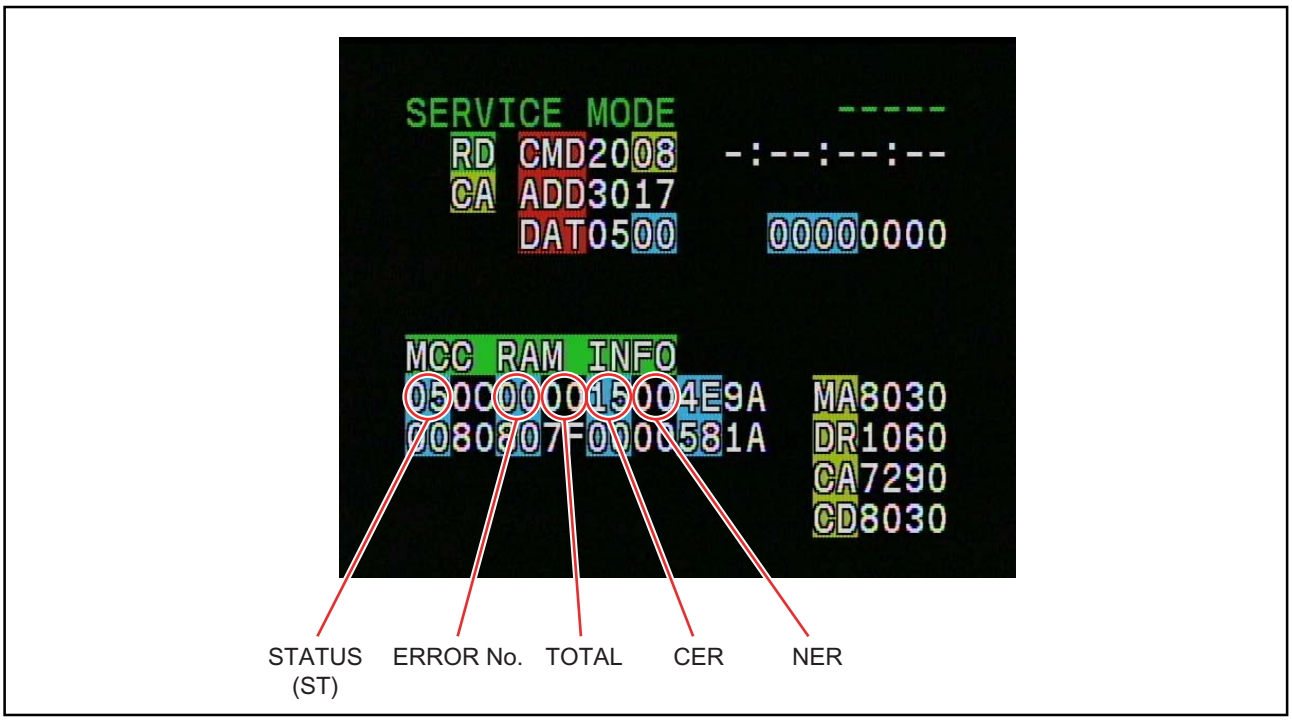

Fig. 21

Error Code Table for CCD image Correction

Error No	Error Conditions	Error No	Error Conditions
01	LED intensity low	0B	RGB difference error
02	LED AE time out	0C	Not used
03	Lc3 dummy leak too large	0D	Shading error (horizontal slope)
04	Lc3 dummy leak ch difference too large	0E	RGB absolute value insufficient
05	Not used	0F	RGB absolute value is too large
06	Lc4 residual err too large	10	Chroma error between 2channels is too large
07	Lc4 residual err ch difference too large	11	Noise level difference between 2channels is too large
08	Lc3/lc4 slope too large	12	time out
09	Gain correction ch difference too large	13	range over
0A	Measure abort		

5-6 Camera Section Adjustment

Notes)

(1) Each adjustment data (5-6-1 to 5-6-5) becomes effective after it is written into the DATA as mentioned in 5-6-6. If power must be turned OFF/ON during each adjustment, be sure to perform the DATA write procedure as mentioned in 5-6-6.

(2) Be sure to carry out adjustments 5-6-2 through 5-6-5 as sequenced in succession. Remember that satisfactory performance will not be attained by performing just one of these adjustments.

Preparation)

(1) For camera section adjustment, take the product condition.

(2) Adjustment condition (initial condition)

Movie/Still	: Movie
Shooting mode	: Program AE
AF	: OFF
Image stabilizer	: OFF
Chart	: Standard angle of view
AE	: P mode
IMAGE EFFECT	: OFF

5-6-1 Iris Adjustment

CHART	Light box (5600°K) not required
SPEC.	Automatic adjustment.

Procedure)

(1) Referring to the table shown below, adjust the Iris.

STEP	PROCEDURE	MONITOR					Microcomputer operation
	IRIS	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right.	2	08	ST	3000	--	
	2) Perform storing.	↑	↑	WR	↑	↑	Adjustment is in progress.
	(press the PAUSE button.)	↑	↑	RD	↑	↑	Adjustment is completed.
							Completion with ST:00 (Others, NG)

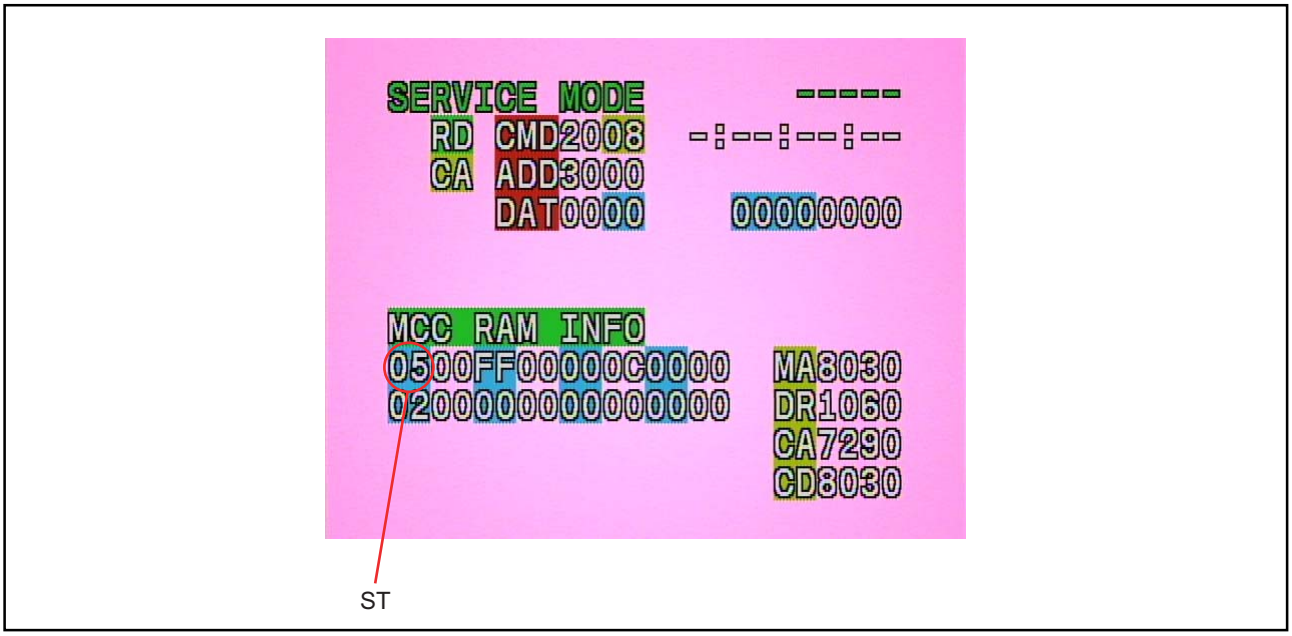

Fig. 22

5-6-2 WB Adjustment (1)

CHART Light box (5600°K)

SPEC. Automatic adjustment

Procedure)

(1) Referring to the table shown below, carry out WB adjustment (1).

Note) In STEP5, color balance gain data is set to FF. Be sure to carry out color balance adjustment described in 5-6-3. In cases where the MAIN PCB has been replaced with a new one, it is not necessary to take the adjustment steps 1 to 4.

STEP	PROCEDURE WB (1)	MONITOR CS	Function	MD	ADDR	DT	Microcomputer operation
1	1) Make the setting shown at right.	2	10	ST	1044	00	
	2) Perform storing.	↑	↑	RD	↑	↑	Target value reset.
	(press the PAUSE button.)						Adjustment is completed.
2	1) Make the setting shown at right.	2	10	ST	1045	00	
	2) Perform storing.	↑	↑	RD	↑	↑	Target value reset.
	(press the PAUSE button.)						Adjustment is completed.
3	1) Make the setting shown at right.	2	10	ST	1046	00	
	2) Perform storing.	↑	↑	RD	↑	↑	Target value reset.
	(press the PAUSE button.)						Adjustment is completed.
4	1) Make the setting shown at right.	2	10	ST	1047	00	
	2) Perform storing.	↑	↑	RD	↑	↑	Target value reset.
	(press the PAUSE button.)						Adjustment is completed.
5	1) Make the setting shown at right.	2	08	ST	3002	--	
	2) Perform storing.	↑	↑	WR	↑	↑	Adjustment is in progress.
	(press the PAUSE button.)	↑	↑	RD	↑	--	Adjustment is completed.
							Completion with ST:05 (Others, NG)

5-6-3 Color Balance Adjustment

CHART Lightbox (5600°K), and color bar chart

SPEC. Automatic adjustment

Procedure)

(1) Referring to the table shown below, carry out automatic adjustment for color balance.

STEP	PROCEDURE WB (2)	MONITOR CS	Function	MD	ADDR	DT	Microcomputer operation
1	1) Make the setting shown at right.	2	08	ST	3003	--	
	2) Perform storing.	↑	↑	WR	↑	↑	Adjustment is in progress.
	(press the PAUSE button.)	↑	↑	RD	↑	↑	Adjustment is completed.
							Completion with ST:05, NG with ST:09

5-6-4 WB Adjustment (2)

CHART Light box (5600°K), and CCA12 filter

SPEC. Automatic adjustment

Procedure)

(1) Referring to the table shown below, carry out WB adjustment (2).

STEP	PROCEDURE	MONITOR					Microcomputer operation
	WB (2)	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right.	2	08	ST	3004	--	
	2) Perform storing.	↑	↑	WR	↑	↑	Adjustment is in progress.
	(press the PAUSE button.)	↑	↑	RD	↑	↑	Adjustment is completed.
							Completion with ST:05, NG with ST:09

5-6-5 WB Adjustment (3)

CHART Light box (5600°K)

SPEC. Automatic adjustment

Procedure)

(1) Referring to the table shown below, carry out WB adjustment (3).

STEP	PROCEDURE	MONITOR					Microcomputer operation
	WB (3)	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right.	2	08	ST	3005	--	
	2) Perform storing.	↑	↑	WR	↑	↑	Adjustment is in progress.
	(press the PAUSE button.)	↑	↑	RD	↑	↑	Adjustment is completed.
							Completion with ST:05, NG with ST:09

5-6-6 Data Writing

SPEC. Data writing

Procedure)

(1) According to the table shown below, write adjustment data (5-6-1 to 5-6-5) into the Flash.

STEP	PROCEDURE	MONITOR					Microcomputer operation
	EEPROM WRITING	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right.	2	08	ST	3006	00	
	2) Perform storing.	↑	↑	RD	↑	--	Completion of Flash writing.
	(press the PAUSE button.)						Completion with ST:05, (NG with ST:09)

5-6-7 CCD Pixel Missing Compensation

Note)

(1) If more than the above number are detected in adjustment, the result of adjustment is indicated as NG and the correction is not performed. Further, if three consecutive missing pixels in a row are detected, the correction is not performed either.
(2) The number of white dot increases with the temperature of the CCD, causing a change in detectable level. If the adjustment is performed after a lapse of time longer than the specified period of power-on, the temperature of the CCD becomes higher than a preset temperature level to result in an increase in the number of white dots detected. In this situation, CCD Pixel Missing Compensation cannot be made properly.
(3) In addition to the CCD Pixel Missing Compensation function mentioned above, this product is provided with a function for automatically correcting pixel missing points each time power is turned on and a function for automatically correcting pixel missing points at the time of shooting at a dark object (interlinked with AGC level adjustment).

CHART	Not required
SPEC.	Automatic writing

Preparation)

(1) Carry out compensation for CCD pixel missing in the product state.
(2) Adjustment condition

Shooting mode	: Program AE
AF	: OFF (Focus short range)
ZOOM	: Telephoto-end
Demo mode	: OFF
Image stabilizer	: OFF

Procedure)

(1) According to the table shown below, carry out CCD Pixel Missing Compensation. (Perform this step about 20 to 60 minutes after power-on. For the DC20 E, be sure to conduct the CCD Pixel Missing Compensation after CCD image adjustment has been made.)
(2) If the result of adjustment is NG (status 09), refer to the error code table shown below.
Furthermore, by observing an actual image, check for stuck/void pixels. Then, judge whether the result of adjustment is OK or NG. (In the case of NG, replace the CCD PCB with a new one.)

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	300E ↑	-- ↑	Blemish detected Adjustment is completed. Completion with ST:05, NG with ST:09
2	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	2 ↑	08 ↑	ST RD	300F ↑	-- ↑	Blemish detection data writing Adjustment is completed. Completion with ST:05, NG with ST:09

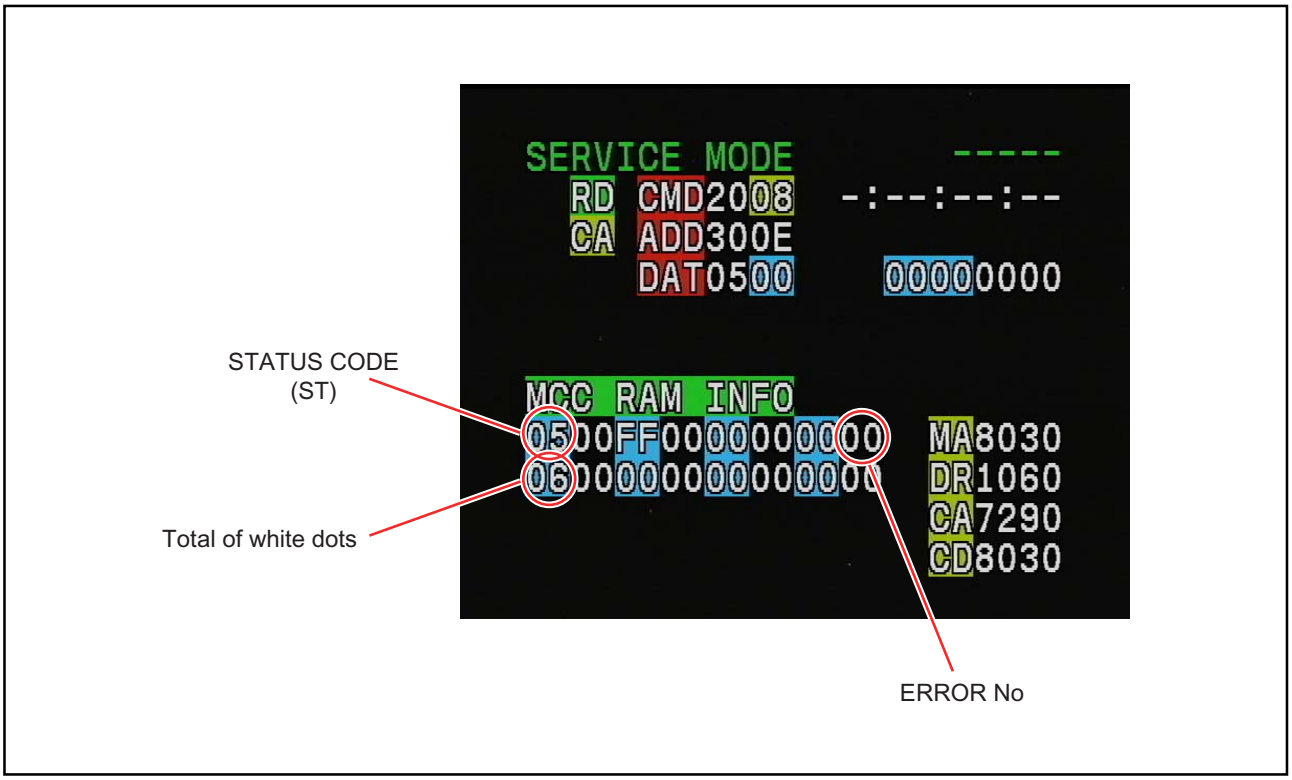

Fig. 23

Error Code Table for CCD Pixel Missing Compensation (DC20 E)

In the DC20 E, if a pixel missing is found on the CCD pixels, it is required to scan each of the RG and GB images. Therefore, white dot detection is performed twice, and the result of the detection is indicated on a bit basis.

Error No	Error Conditions
00	Normal end
10	The number of white dots has exceeded the upper limit in the first time of detection
20	The number of white dots has exceeded the upper limit in the second time of detection
40	The total number of white dots in the first time and second time of detection has exceeded the upper limit
80	In white dot detection, three consecutive missing pixels in a row are detected.

5-7 Recorder Section Adjustment

Preparation)

(1) Carry out setup/check in the product state.

5-7-1 Playback error rate check

MODE	Playing back DVD-R Reference disc PAL (DY9-1408-000)
SPEC.	Error rate 3.3×10^{-3} or less

Procedure)

(1) While playing back the reference disc, carry out error rate check referring to the table shown below.

STEP	PROCEDURE	MONITOR					Microcomputer operation
	SWP (AUTO)	CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right.	0	05	ST	0001	01	
	2) Perform storing.	↑	↑	WR	↑	↑	
	(press the PAUSE button.)	↑	↑	RD	↑	00	Error rate indication.

Note)

* It takes 7 to 20 seconds to indicate an error rate, because it is calculated from large amount of data.
* To measure an error rate again, it is once required to stop the playback.

If the result of the error rate check is NG, perform recheck according to 2-3-1 “Flowchart for Playback Image Error Check” in Service Hint.

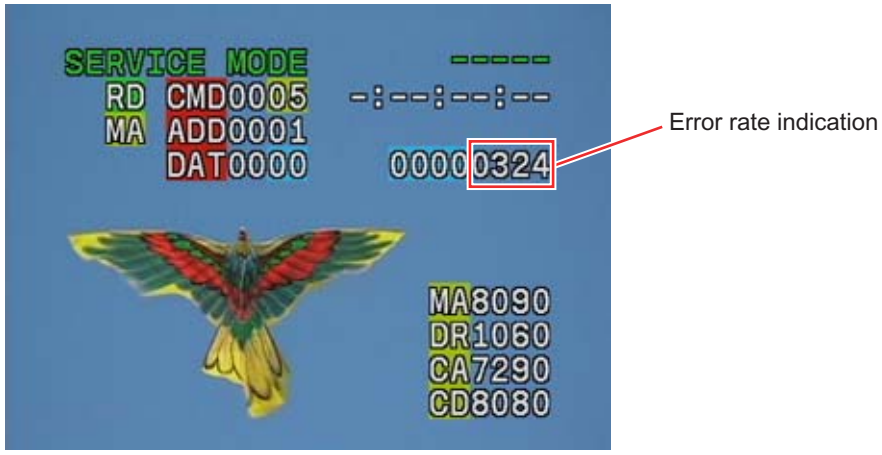

Fig. 24

5-7-2 Self-recording error rate check

MODE	Playing back the self-recording DVD-RW
SPEC.	Error rate 8.0×10^{-3} or less

Procedure)

(1) While playing back the self-recording DVD-RW disc, carry out error rate check referring to the table shown below.

STEP	PROCEDURE C.FG(AUTO)	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Recording for a period of approx. 10 to 30 sec.						
2	1) Playing back the part recorded in STEP 1.						
3	1) Make the setting shown at right.	0	05	ST	0001	01	
	2) Perform storing.	↑	↑	WR	↑	↑	
	(press the PAUSE button.)	↑	↑	RD	↑	00	Error rate indication.

Note)

(1) For self-recording error rate measurement, use a 8-cm DVD-RW disc manufactured by Maxell.
(2) Select the video recording mode.
(3) In principle, the same conditions are provided in use of any recording mode for error rate measurement. It is however advisable to select the SP mode.

Note)

* It takes 7 to 20 seconds to indicate an error rate, because it is calculated from large amount of data.
* To measure an error rate again, it is once required to stop the playback.

If the result of the error rate check is NG, perform recheck according to 2-3-1 “Flowchart for Playback Image Error Check” in Service Hint.

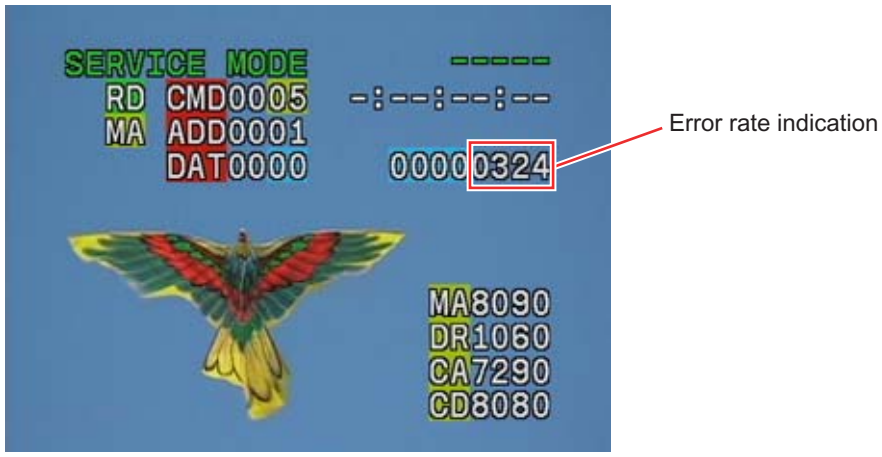

Fig. 25

5-7-3 LCD PCB Setting Destination

When mounting the LCD PCB of service part, perform the following adjustment.

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
1	1) Make the setting shown at right.	0	20	ST	0003	--	
	2) Add "09" to the current value, and store the result data.	↑	↑	RD	↑	ADJ	

5-8 CVF Adjustment

For this camcorder, CVF adjustment is optional. However, if malfunction is found in CVF image, picture quality or color after replacement of a CVF-related part, be sure to carry out the following adjustment.

Note)

(1) The adjustments from 5-8-3 through 5-8-5 must be carried out in sequence.
Remember that Satisfactory performance will not be attained unless all adjustments are performed.

Preparation)

(1) Carry out CVF adjustment in the camera mode in the product condition.

5-8-1 Forced CVF ON, Adjustment Image (B/W) Setting

Procedure)

(1) Referring to the table shown below, make the setting.

STEP	PROCEDURE	MONITOR					Adjustment points and range
		CS	Function	MD	ADDR	DT	
Forced CVF ON	1) Make the setting shown at right.	0	00	ST	0004	02	Start of setting
	2) Perform storing.	↑	↑	RD	↑	↑	Completion of setting
	(press the PAUSE button.)						
Black and white image	1) Make the setting shown at right.	2	08	ST	330F	--	
	2) Perform storing.	↑	↑	RD	↑	↑	Completion of setting
	(press the PAUSE button.)						

5-8-2 CVF Frequency Adjustment

M. EQ.	Frequency counter
TP.	Extension connector - pin 4 (EVF HD)
SPEC.	15.734 ± 0.1kHz

Procedure)

(1) Carry out adjustment according to the table shown below.
Note) When the following adjustment is in progress (MD: ST), the LCD and CVF images are not synchronized, but it is not malfunction.

STEP	PROCEDURE	MONITOR					Adjustment points and range
		CS	Function	MD	ADDR	DT	
CVF Frequency	1) Make the setting shown at right.	0	21	ST	0003	"ADJ"	Start of setting
Adjustment	2) Perform storing.	↑	↑	RD	↑	ADJ	Completion of setting
	(press the PAUSE button.)						

5-8-3 COM-DC Level Adjustment

MODE	Display of monochrome master
M. EQ.	Oscilloscope
TP/TRIG.	Extension connector - pin 18 (EVF COM DC) / TP signal (self TRIG)
SPEC.	2.30 ± 0.05 [V] (DC. P-P center of EVF COM to GND level)

Procedure)

(1) Carry out adjustment according to the table shown below.

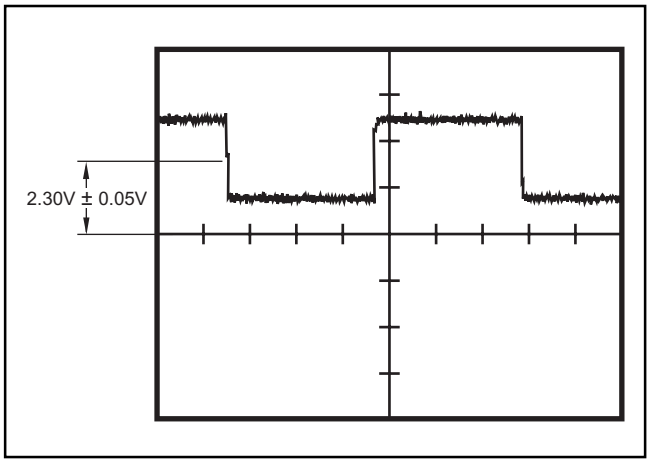

Fig. 26

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
COM-DC Level	1) Make the setting shown at right.	0	21	ST	0004	"ADJ"	Start of setting
Ajustment	2) Perform storing.	↑	↑	RD	↑	ADJ	Completion of setting
	(press the PAUSE button.)						

5-8-4 COM Amplitude Adjustment

MODE	Display of monochrome master
M. EQ.	Oscilloscope
TP/TRIG.	Extension connector - pin 14 (EVF COM AC) / TP signal (self TRIG)
SPEC.	4.00 ± 0.05 [V]

Procedure)

(1) Carry out adjustment according to the table shown below.

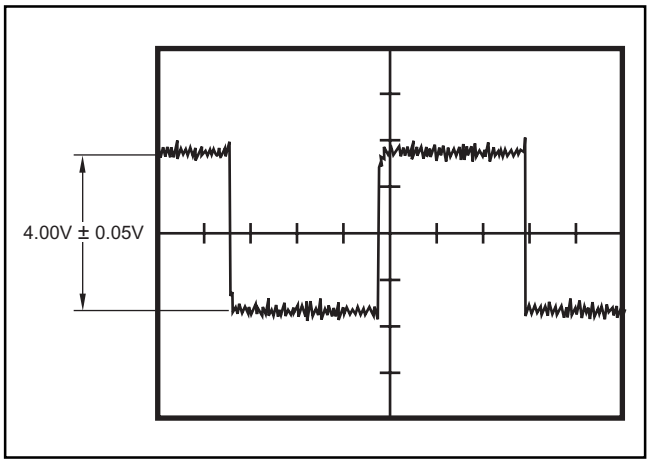

Fig. 27

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
COM Amplitude Adjustment	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	21 ↑	ST RD	000C ↑	"ADJ" ADJ	Start of setting Completion of setting

5-8-5 Brightness Adjustment

MODE	Display of monochrome master
M. EQ.	Oscilloscope
TP/TRIG.	Extension connector - pin 15 (G), pin 13 (R), pin 16 (B), / TP signal (self TRIG)
SPEC.	2.80 ± 0.05 [V]

Procedure)

(1) Carry out adjustment according to the table shown below.
(2) After adjustment, make sure the contrast adjustment performed in 5-8-6 is not deteriorated. If deteriorated, repeatedly carry out the contrast adjustment in 5-8-6 and brightness adjustment in 5-8-5.

Note) In the service mode, the waveform observation point is hard to locate. For locating the waveform observation point, transfer to the normal mode beforehand.

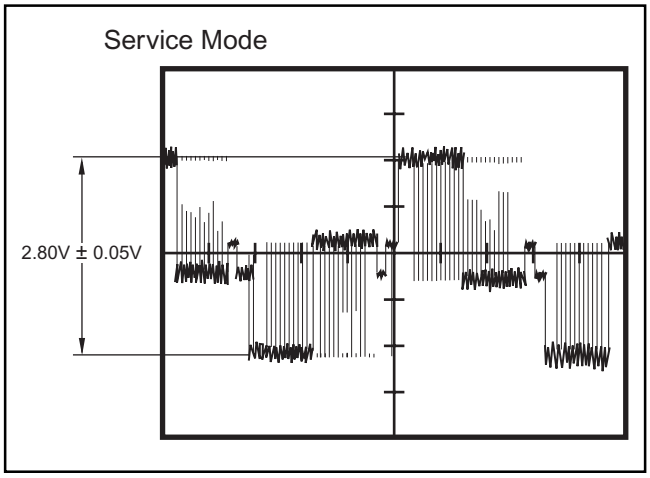

Fig. 28

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
Brightness Adjustment (G)	1) Make the setting shown at right.	0	21	ST	0006	"ADJ"	Start of setting
	2) Perform storing. (press the PAUSE button.)	↑	↑	RD	↑	ADJ	Completion of setting
Brightness Adjustment (R)	1) Make the setting shown at right.	0	21	ST	0008	"ADJ"	Start of setting
	2) Perform storing. (press the PAUSE button.)	↑	↑	RD	↑	ADJ	Completion of setting
Brightness Adjustment (B)	1) Make the setting shown at right.	0	21	ST	000A	"ADJ"	Start of setting
	2) Perform storing. (press the PAUSE button.)	↑	↑	RD	↑	ADJ	Completion of setting

Note) The adjustment sequence is important. Be sure to adjust (G) first, and then (R) and (B).

5-8-6 Contrast Adjustment

MODE	Display of monochrome master
M. EQ.	Oscilloscope
TP/TRIG.	Extension connector - pin 15 (G), pin 13 (R), pin 16 (B), / TP signal (self TRIG)
SPEC.	2.30 ± 0.05 [V]

Procedure)

(1) Carry out adjustment according to the table shown below.

Note) In the service mode, the waveform observation point is hard to locate. For locating the waveform observation point, transfer to the normal mode beforehand.

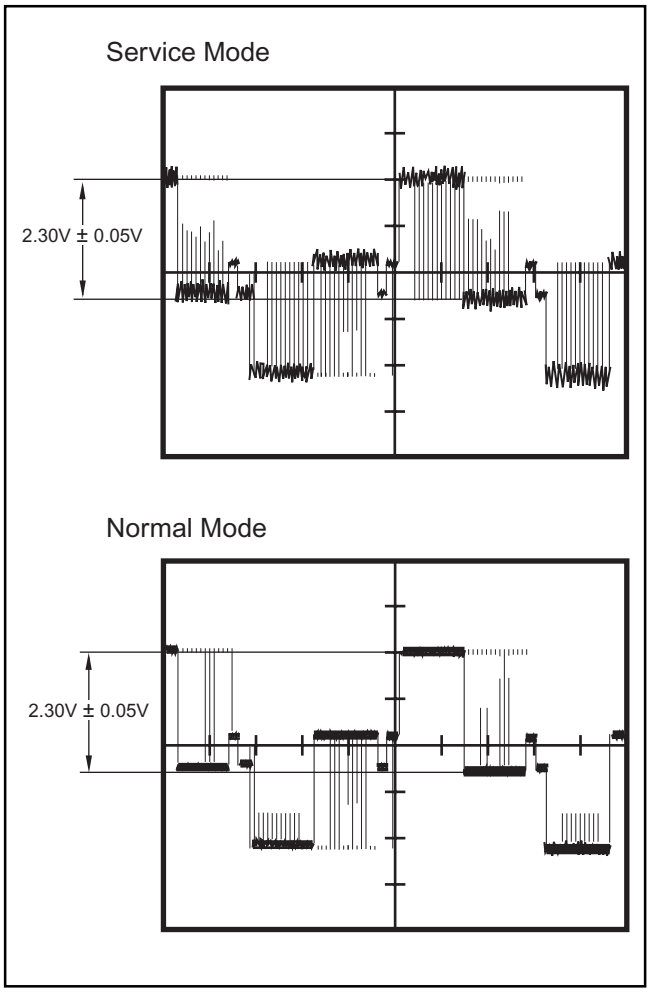

Fig. 29

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
Contrast Adjustment (G)	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	21 ↑	ST RD	0007 ↑	"ADJ" ADJ	Start of setting Completion of setting
Contrast Adjustment (R)	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	21 ↑	ST RD	0009 ↑	"ADJ" ADJ	Start of setting Completion of setting
Contrast Adjustment (B)	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	21 ↑	ST RD	000B ↑	"ADJ" ADJ	Start of setting Completion of setting

Note) The adjustment sequence indicated above should be observed.
If the ST mode has been selected at the time of contrast adjustment, the black limiter is released automatically. Therefore, it is not required to make setting in this case.
Be sure to perform adjustment (G) first, and then adjustments (R) and (B).

5-8-7 Release of Forced CVF ON

Procedure)

(1) Referring to the table shown below, make the setting.

STEP	PROCEDURE	MONITOR					Microcomputer operation
		CS	Function	MD	ADDR	DT	
Release of Forced CVF ON	1) Make the setting shown at right. 2) Perform storing. (press the PAUSE button.)	0 ↑	00 ↑	ST RD	0004 ↑	00 ↑	Start of setting Completion of setting

Note) The monochrome image display mode can be reset by turning power off/on.

SERVICE HINTS

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1. Service Hints

1-1 Arrangement of Circuit Boards

The printed circuit boards are arranged as shown below.

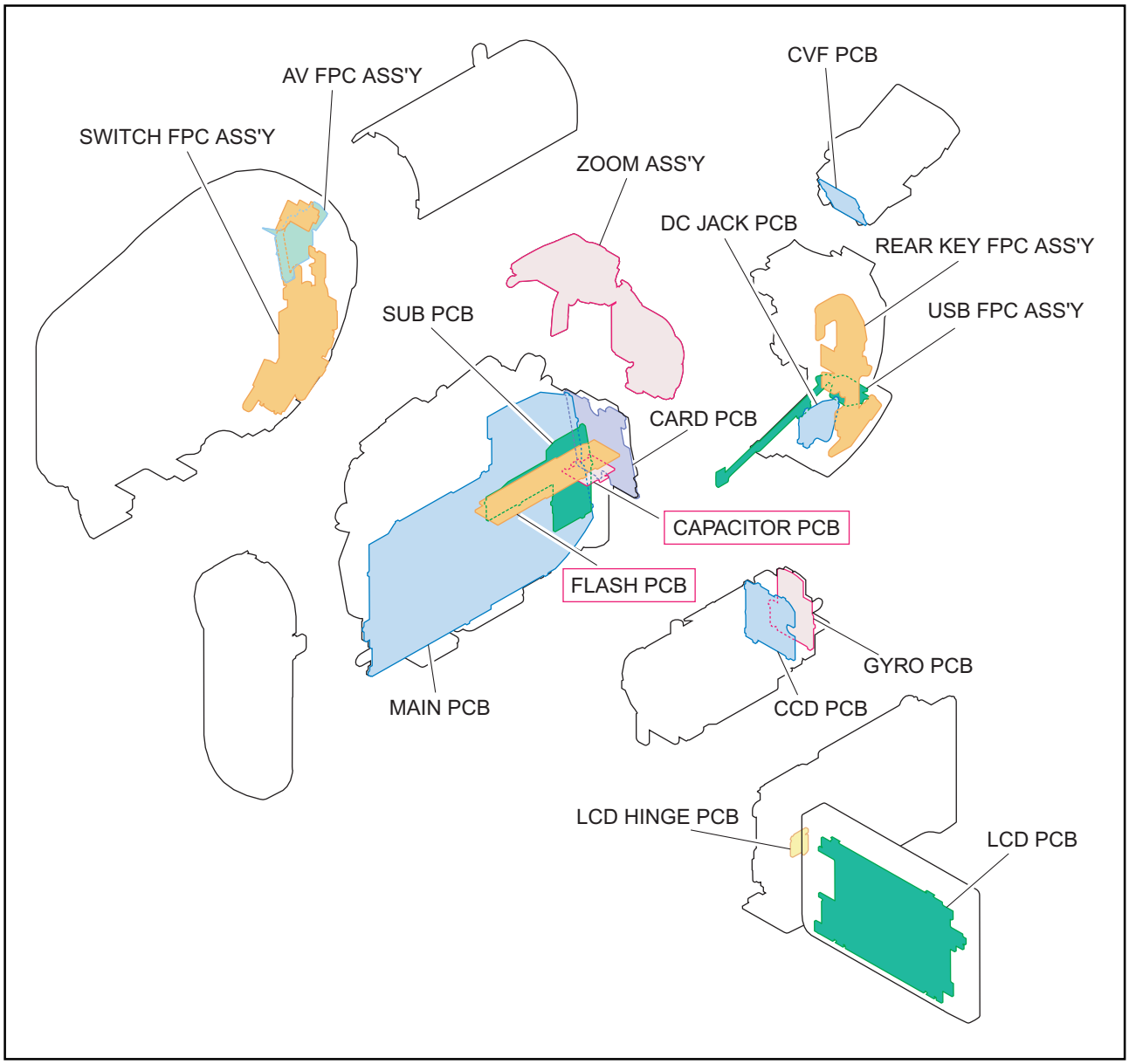


Fig. 1

Note) FLASH PCB and CAPACITOR PCB are only for DC20 E.

1-2 Location of Main Elements

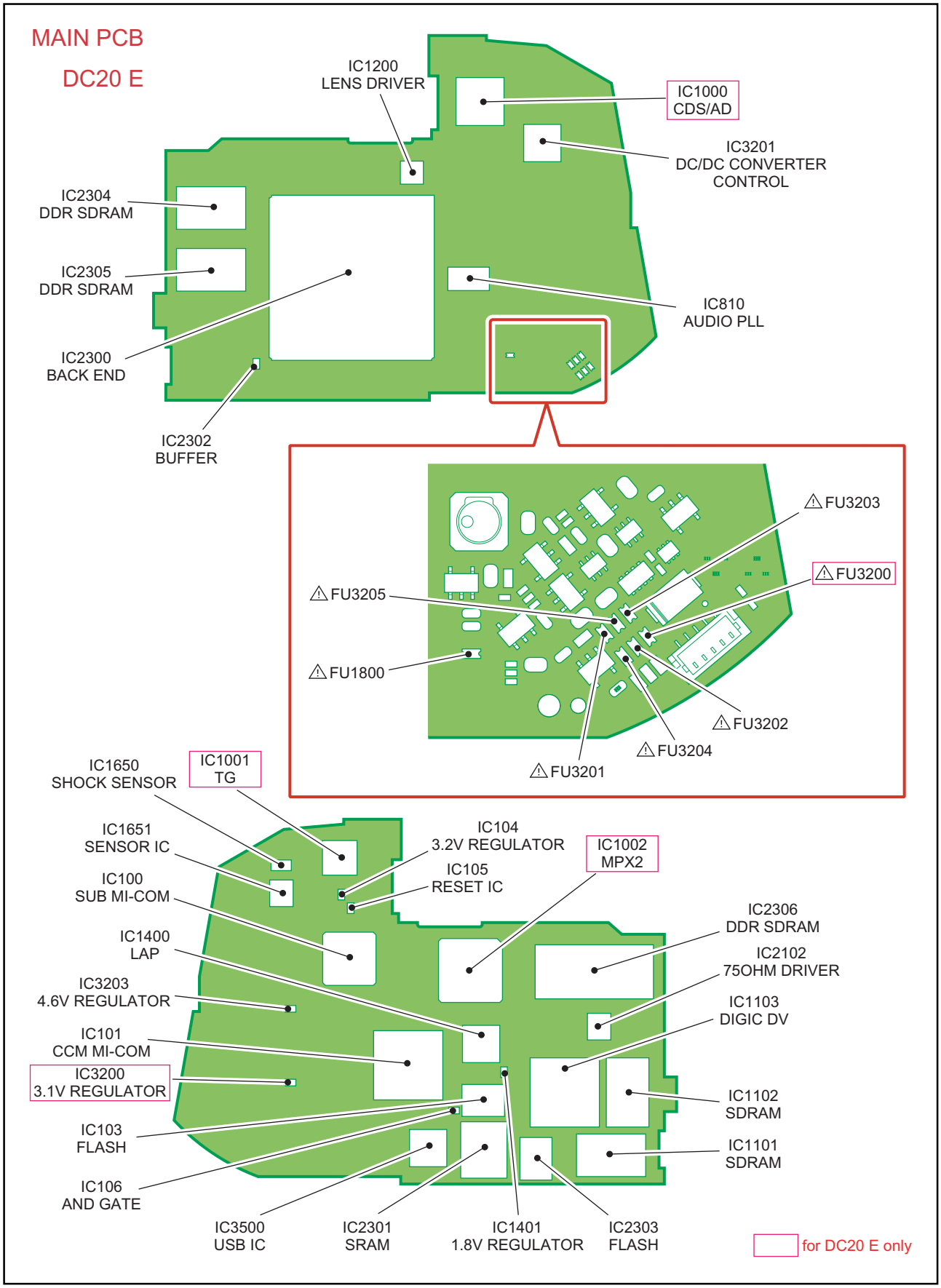


Fig. 2

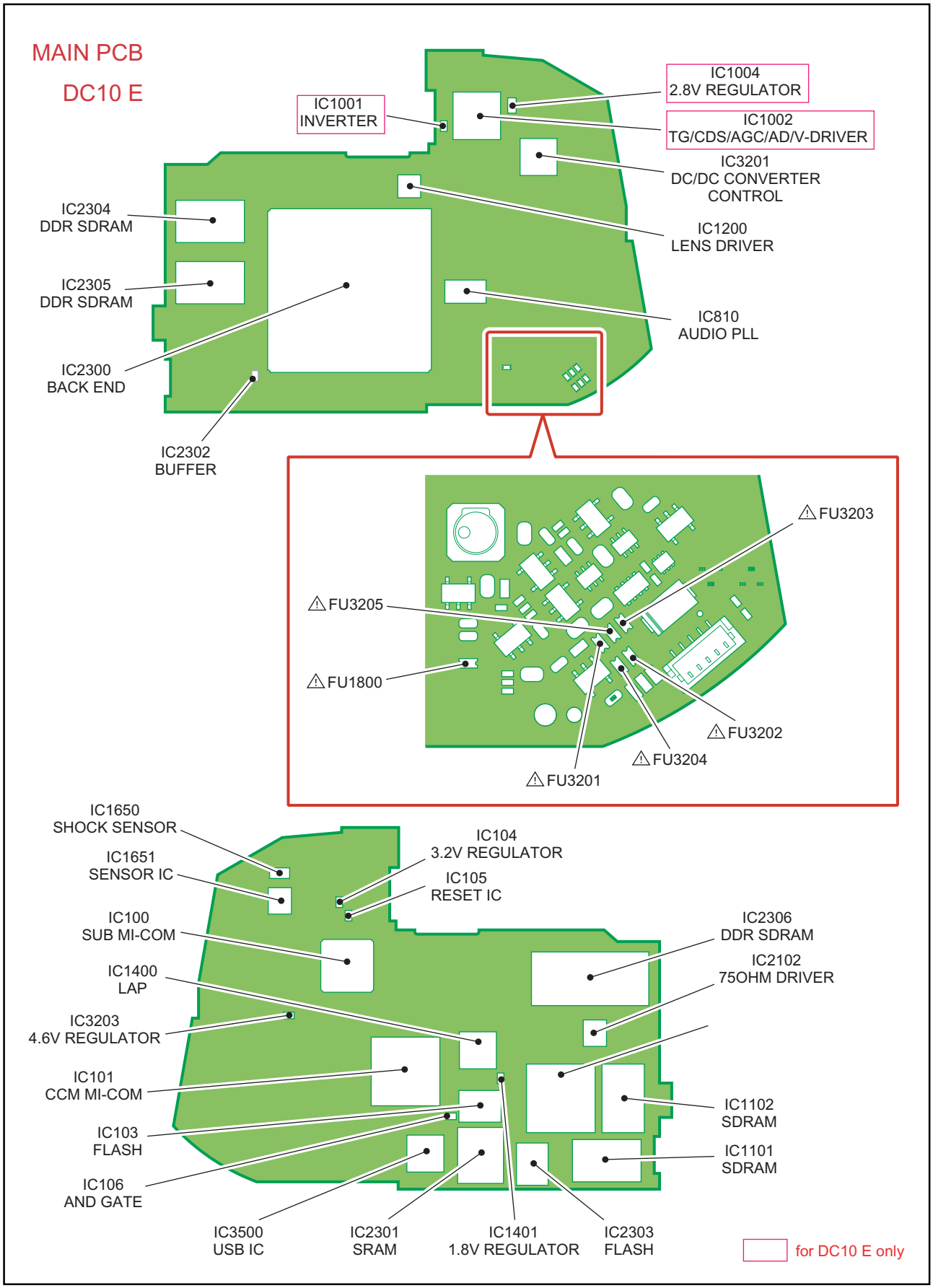

MAIN PCB
DC10 E
IC1001
INVERTER
IC1004
2.8V REGULATOR
IC1002
TG/CDS/AGC/AD/V-DRIVER
IC3201
DC/DC CONVERTER
CONTROL
IC1200
LENS DRIVER
IC2304
DDR SDRAM
IC2305
DDR SDRAM
IC2300
BACK END
IC2302
BUFFER
IC810
AUDIO PLL
⚠FU3203
⚠FU3205
⚠FU1800
⚠FU3202
⚠FU3204
⚠FU3201
IC1650
SHOCK SENSOR
IC1651
SENSOR IC
IC104
3.2V REGULATOR
IC105
RESET IC
IC100
SUB MI-COM
IC1400
LAP
IC3203
4.6V REGULATOR
IC101
CCM MI-COM
IC103
FLASH
IC106
AND GATE
IC2306
DDR SDRAM
IC2102
75OHM DRIVER
IC1102
SDRAM
IC1101
SDRAM
IC3500
USB IC
IC2301
SRAM
IC1401
1.8V REGULATOR
IC2303
FLASH
for DC10 E only

Fig. 3

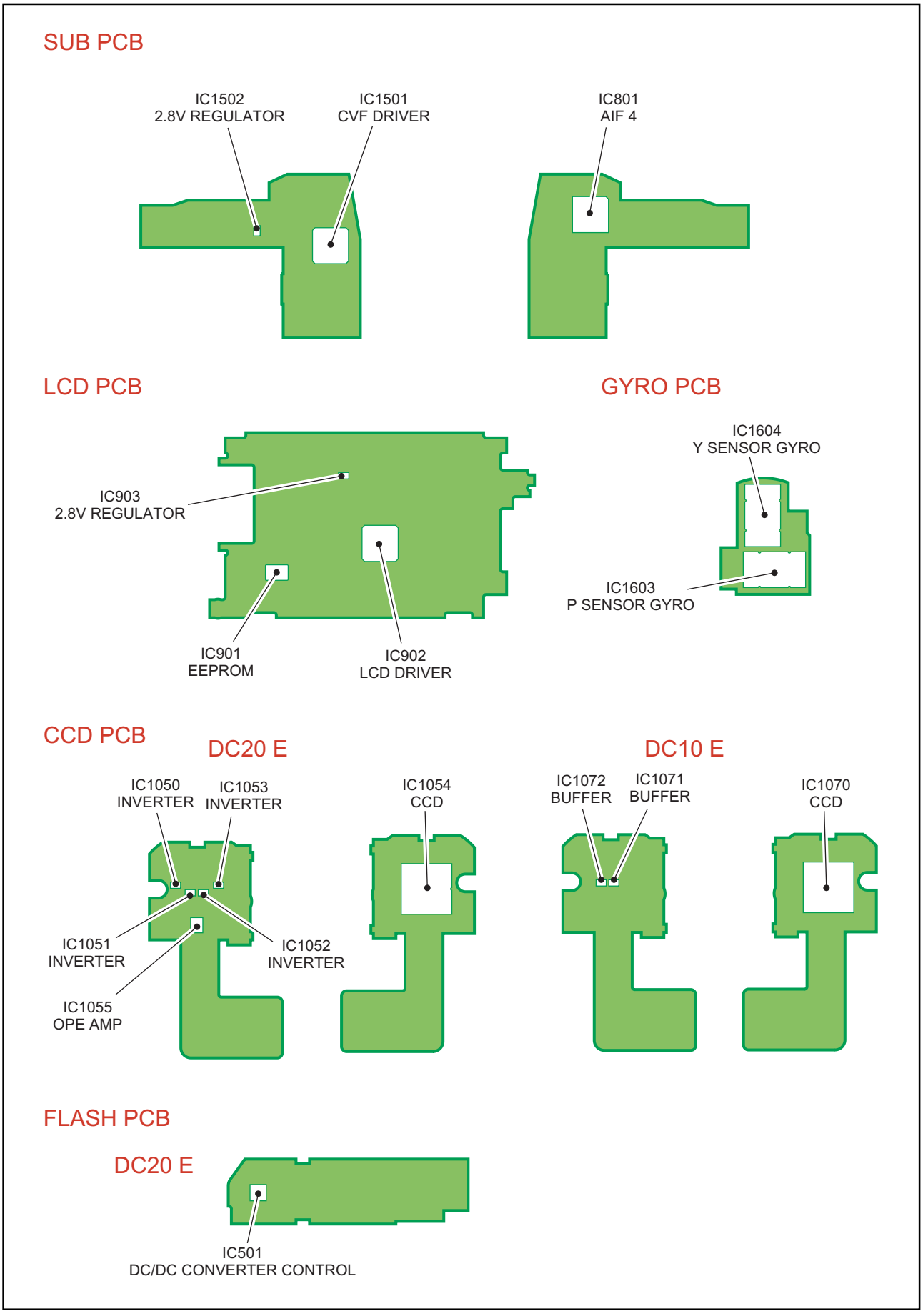

SUB PCB
IC1502
2.8V REGULATOR
IC1501
CVF DRIVER
IC801
AIF 4
LCD PCB
IC903
2.8V REGULATOR
IC901
EEPROM
IC902
LCD DRIVER
GYRO PCB
IC1604
Y SENSOR GYRO
IC1603
P SENSOR GYRO
CCD PCB
DC20 E
IC1050
INVERTER
IC1053
INVERTER
IC1054
CCD
IC1051
INVERTER
IC1052
INVERTER
IC1055
OPE AMP
DC10 E
IC1072
BUFFER
IC1071
BUFFER
IC1070
CCD
FLASH PCB
DC20 E
IC501
DC/DC CONVERTER CONTROL

Fig. 4

1-3 Current Consumption Check

The following table shows the specified value of current consumption in each status.

Measurement condition : Product status, DVD-RW (Video mode), recording mode : XP, camera auto mode (AF OFF), LCD ON (Approx. 0.03A each smaller in the case of CVF)

Preset voltage : 7.4V

DC10 E

POWER SW	MODE	Current consumption (A)
CAMERA	REC PAUSE	0.47
	REC	0.84
PLAY	PLAY (DISC)	0.71
	PLAY (CARD)	0.40
POWER OFF		0.79 (mA)

DC20 E

POWER SW	MODE	Current consumption (A)
CAMERA	REC PAUSE	0.55
	REC	0.93
PLAY	PLAY (DISC)	0.76
	PLAY (CARD)	0.45
POWER OFF		0.71 (mA)

2. Troubleshooting

To detect the defective parts for repair, if any, use the following hints and check points.

2-1 Power Supply Malfunction

<Hints>

When the power source is attached, the unit enters the standby mode in the following sequences.

Main power is connected. → UNREG is supplied to the MAIN PCB → SUB MI-COM starts up. → CCM MI-COM starts up. → SUB MI-COM outputs VCR ON "H" signal. → PWM driver starts up and turns on each power supply. → Establishes communication with the BACK END → The CCM MI-COM is brought into standby status with the VCR ON changed to VCR Low.

After that, the power supply is turned ON by the following procedures.

Power supply mode switch operation → After received by MODE MI-COM, VCR ON "H" is output. → The PWM driver is starts to turns on various power supplies. → The MI-COM in the BACK END is started up to control the system.

<Check Points>

1) Key Input
   Check the key input at Power Switch in service mode.
2) Check of microcomputer-to-microcomputer communication
   If the microcomputer-to-microcomputer communication line is normal, the version number of each microcomputer will be displayed in service mode. Otherwise, the communication line or microcomputer may be faulty.
3) Fuses on the power supply PCB
   Check the continuity of the fuses FU3200, 3201, 3202, 3203, 3204, 3205 and 1800 on the MAIN PCB. If NG, replace the fuse and check the power consumption. (FU3200 is for DC20 E only.)
4) Replace the MAIN PCB with a service part and check the operation.

2-2 Camera Picture Malfunction

<Hints>

A flow of camera picture (EE) is as below.
CCD → CCD PCB → MAIN PCB (DIGIC DV) → FRONT END → AV FPC ASS'Y

<Check Points>

1) Check lens reset ("SERVICE MODE / ADJUSTMENT" P.9)
   If no camera picture appears, check in service mode if the lens has been reset. If NG, check the lens.
2) Check index screen display
   If the index screen is confirmed, the signal lines after FRONT END are considered to be OK.
3) Check of DIGIC DV generation signal (white 100% or color bar) ("SERVICE MODE / ADJUSTMENT" P.8)
   The white 100% or color bar signals are generated by the DIGIC DV on the MAIN PCB. In service mode, if the output of the white 100% or color bar signal is attained, the signal lines after DIGIC DV are considered to be OK.
4) Check by commands particular to camera ("SERVICE MODE / ADJUSTMENT" P.8)
   Check the operation of White balance, AGC, IRIS, etc. in service mode.

2-3 Malfunction of Playback Picture

2-3-1 Flow Chart for Checking Malfunction of Playback Picture

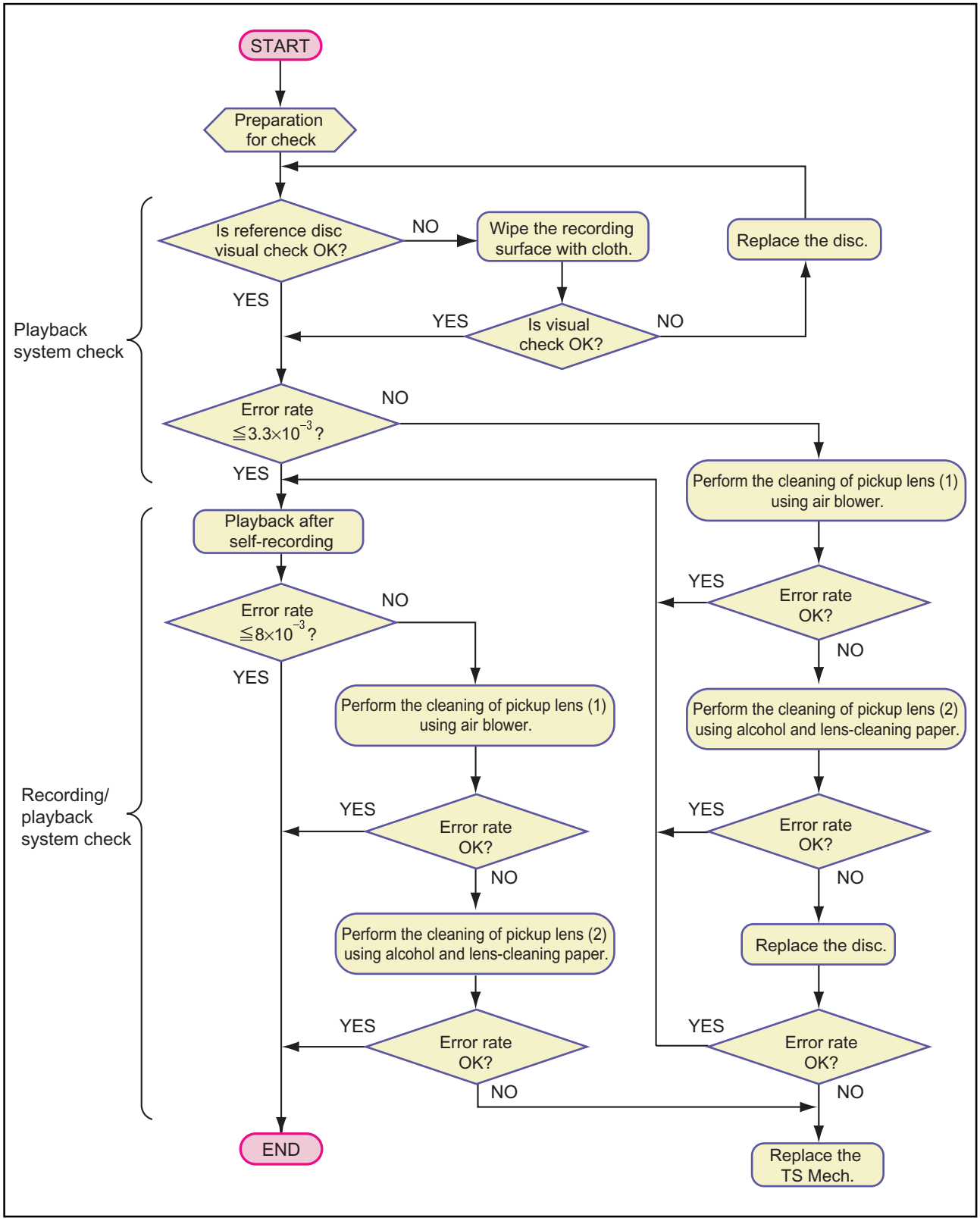


Fig. 5

2-3-2 Checking Method

<Hints>

In the DVD, degradation of picture quality normally appears on the screen as block noise, as in the DV. This is because, if an error occurs exceeding the ability of the error correction circuit, the block by block information of pictures is not played back properly and thus complemented by the previous picture information. Normally, such block noise appears on the screen when the error rate has considerably been degraded due to the contaminated disc or flaws, etc. Be sure to check the playback picture quality by the error rate.

<Check Points>

(1) Visual check of reference disc

Check the recording surface of the reference disc for contamination or flaws. If the recording surface is contaminated, softly wipe the disc outward from its center using soft cloth.

* The reference disc is a DVD-R disc of 8 cm, and classified as NTSC or PAL specification. For NTSC specification, use DY9-1407-000. The reference disc can be used, not only for checking an error rate, but also for checking the playback picture on the monitor, because it also contains video images (4:3, 16:9).
* On the unit with different TV system, the reference disc cannot recognize the disc. This means that it cannot be used for checking an error rate.

For NTSC : DY9-1407-000　　For PAL : DY9-1408-000

Fig. 6

(2) Playback error rate check (“SERVICE MODE / ADJUSTMENT”, p.36)

While the reference disc is played back, check error rate in the service mode.

Playback position: Three positions: Inner, center and outer positions. By changing the disc chapter, the playback position can be changed.(*)

Error rate standard : 3.3×10^{-3}

In the case of NG, execute the steps from 1) shown below.

* Relationships between playback position and chapter

On the reference disc, data is recorded from the inner circumference to the outer circumference.

Example : In the case of a reference disc with scenes 1 to 8

Playback position	Inner circumference ◄——►	Outer circumference
Scene	1 ◄——►	8

(3) Self-recording error rate check (“SERVICE MODE / ADJUSTMETN”, P. 37)
Using a new DVD-RW disk (Commercially available), check an error rate during self-recording playback.

Disc to be used	: Hitachi’s Maxell DVD-RW of 8 cm (If the procurement is difficult in an oversea location, SONY’s DVD-RW of 8 cm is allowed to be used.)
Recording mode	: VIDEO mode
Recording mode	: SP mode (Recommendation)
Recording time	: Approx. 10 to 30 sec.
Recording position	: Not specifically designated. Write the record as a postscript without initializing.
Specified range of error rate	: 8.0×10^{-3}

1) Cleaning of pickup lens (1)
Open the Disc Cover and clean the pickup lens surface with a an air blower that is commercially available. After cleaning, check the error rate again.
* Do not use an air blower of spray-can type because blowing power is too strong.
* Do not touch the lens with bare hand.

2) Cleaning of pickup lens (2)
If an error rate is out of the specified range, clean the pickup lens surface using Lens-cleaning paper and alcohol.
Using forceps whose ends are wound with lens-cleaning paper that is wet with alcohol, wipe the lens surface by moving the forceps once in a single direction.
After cleaning, check the error rate again.
* Be sure to use ethyl alcohol (commercially available product). Never use other solvents.
* If you have spilled alcohol by mistake onto the cover, do not rub it for removal as its coating will come off. For cleaning the surface of the cover, wipe it with a dry cloth without using alcohol.

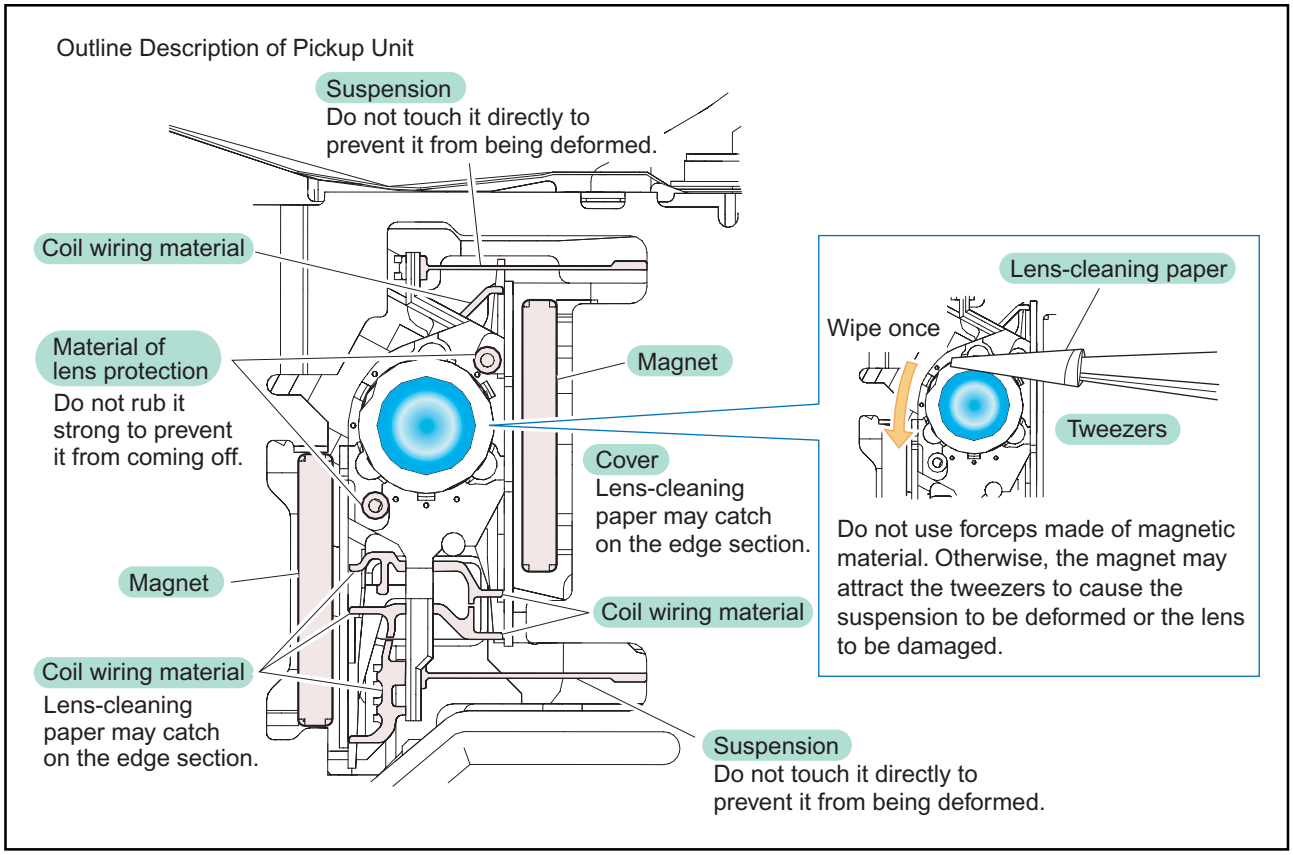

Outline Description of Pickup Unit
Suspension
Do not touch it directly to prevent it from being deformed.
Coil wiring material
Material of lens protection
Do not rub it strong to prevent it from coming off.
Magnet
Cover
Lens-cleaning paper may catch on the edge section.
Magnet
Coil wiring material
Coil wiring material
Lens-cleaning paper may catch on the edge section.
Suspension
Do not touch it directly to prevent it from being deformed.
Lens-cleaning paper
Wipe once
Tweezers
Do not use forceps made of magnetic material. Otherwise, the magnet may attract the tweezers to cause the suspension to be deformed or the lens to be damaged.

Fig. 7

3) Replacement with another reference disc

If an error rate is out of the specified range, replace the reference disc with another one. After replacement, check the error rate again.

* In some cases, an error rate may appear in a worse state than the actual state depending on the conditions (lot and recording surface condition) of the disk used.

4) Replacement of TS Mech unit

If an error rate is out of the specified range, replace the TS Mech unit.

2-4 Cautions on Handling TS Mech Unit

<Hints>

The TS mech unit is of a precision design. When handling it, exercise extreme care, with the full understanding of the following points.

<Check Points>

(1) Cautions on handling

- The Disc Cover cannot be opened unless the power for the main unit is turned on. Avoid trying to open the cover forcibly. First turn on the power and then open the Disc Cover.
- It may require a longer time to take out the TS Mech depending on the disc condition and its recorded contents.

(2) Caution for antistatic protection

Since the TS mech unit contains a control circuit board, wear a static dissipative wrist band (commercially available) for antistatic protection.

(3) Cautions about laser beam

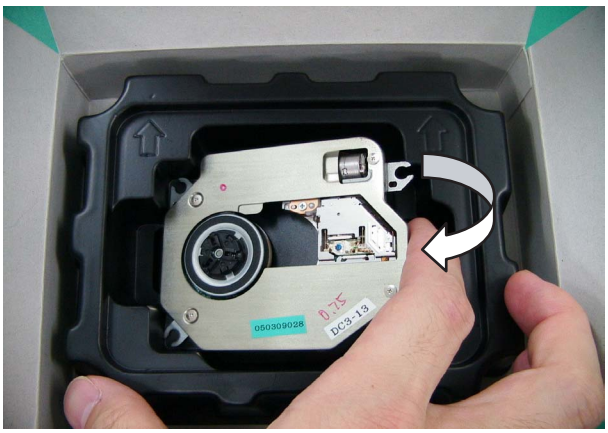
- The laser beam is emitted in the TS Mech.
  If the laser beam gets in your eyes, it could cause eye damage, so never disassemble the TS Mech.
- This product's laser beam condenses light using an objective lens in the light pick up, so that it strikes a focal point on the disk's recording surface. Therefore, make sure that your eyes are at least 30 cm away from the objective lens when the laser diode is emitting light.

Note : In complete products, the laser beam is not normally emitted when the Disc Cover is open. The laser beam is emitted when the two open/closed detection sensors near the Disc Cover are set to closed or when the Disc Cover on a disassembled product is closed and the operation of the TS Mech is being checked.

(4) How to take up the service parts

Since the white flexible cable bulges out of the control P.C.B., holding the left side of the TS Mech by hand means holding the flexible cable by hand. In this way, the flexible cable may be excessively loaded to result in its wire breakage. Thus, when taking out the TS Mech from the container, never hold its left side, but hold its right side, as shown in the figures below. (Fig. 8)

Caution: If the flexible cable is broken, it is required to replace the entire TS Mech unit, because there is no replacement part for the flexible cable alone.



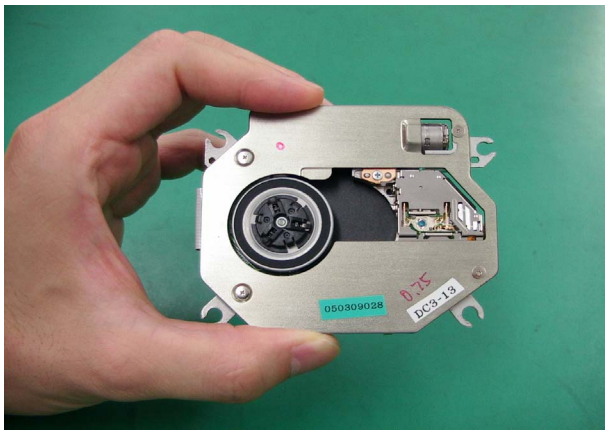
Right way to take out the TS Mech
(First lift up its right side, and then take up the TS Mech by holding its upper and lower sections.)

Wrong way to take out the TS Mech

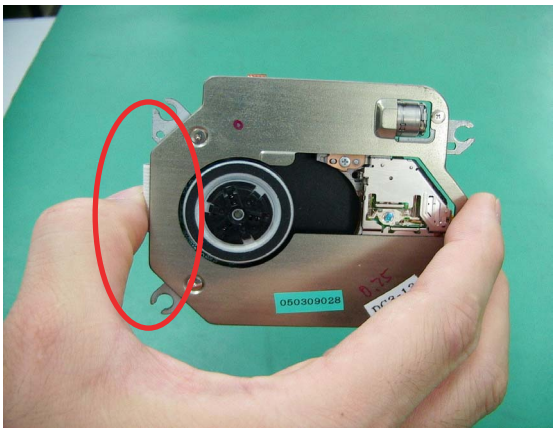
Fig. 8

(5) How to hold the TS Mech

As instructed in step (2) above, do not hold the left section, that is, the flexible cable, of the TS Mech, but hold the upper and lower sections. (Fig. 9)



Right way to hold the TS Mech



Wrong way to hold the TS Mech
Do not hold the section circled in red,
that is, the flexible cable.

Fig. 9

(6) How to place the TS Mech

Be sure to place the detached TS Mech with its pickup lens upward. At this time, do not leave the TS Mech for a long time without covering its lens. Store it with its lens covered.

(7) Cautions on containing the TS Mech into the service parts box

Both the upper and lower halves of the black container for service parts have antistatic effect. Thus place the TS Mech in the container as it is, without covering it.

Caution: Do not put the TS Mech in a vinyl bag before placing it in the container. Or the vinyl bag may touch and cause damage to the pickup during transportation. The upper and lower halves of the container can fix the pickup position without touching the pickup directly.

(8) How to move the pickup from the inner circumference to the outer circumference

<Hints>

The TS Mech has two different pickup (hereinafter referred to as “PU”) positions: the PU stop position after the power for the main unit is turned off and the PU fixed position on the service parts. The former has its PU stopped on the inner circumference, and the latter has its PU stopped on the outer circumference. Thus when placing the TS Mech detached form the product in the container for transportation, it is required to move the PU stop position from the inner circumference to the outer circumference manually.

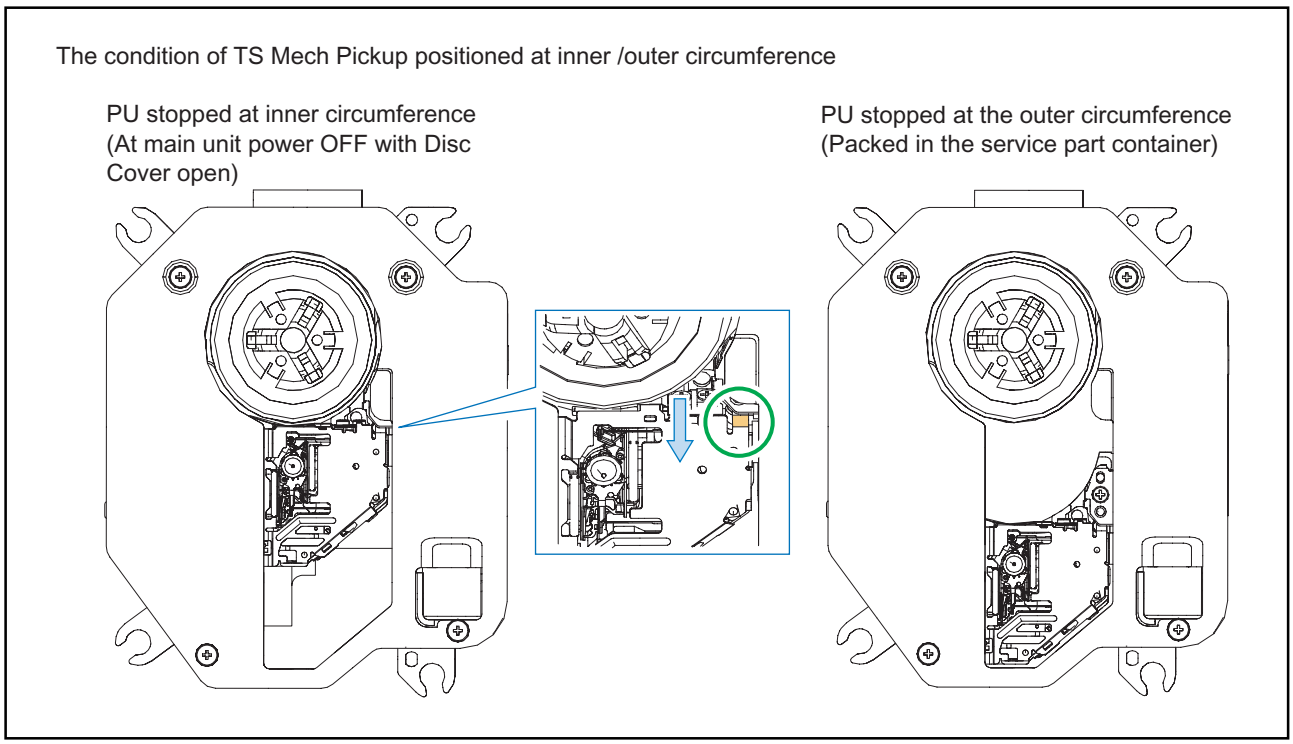

The condition of TS Mech Pickup positioned at inner /outer circumference
PU stopped at inner circumference
(At main unit power OFF with Disc Cover open)
PU stopped at the outer circumference
(Packed in the service part container)

Fig. 10

<Check Points>

1) Tool Reauired
   Tweezers made of non-magnetic material whose ends are not sharp, or a bar-like article (made of plastic or wood)
2) Moving method
   Slowly push the section shown in the figure (orange-colored section) outward. Pushing the other section may damage the pickup section. When the pickup has reached the outer circumference, do not keep on pressing further.

(9) How to eject the disc if the Disc Cover cannot be opened (forced opening)

1) Insert tweezers into the part A, and disengage the claw on the upper side of the Center Cover Lid. Then, remove the Center Cover Lid. (See Figure 11.)

Note : Since the Center Cover Lid is not to be reused, you may damage the cover or break its claw. Take care, however, not to damage the R Upper Cover and the Center Cover located around it.

Fig. 11

2) Remove the R Upper Cover, R-LCD Unit, Front Cover Unit, Rear Cover Unit, CVF Unit, Camera Unit, and Center Cover.

3) The pin for opening the Disc Cover will appear. Open the Disc Cover by sliding the pin to the open position.

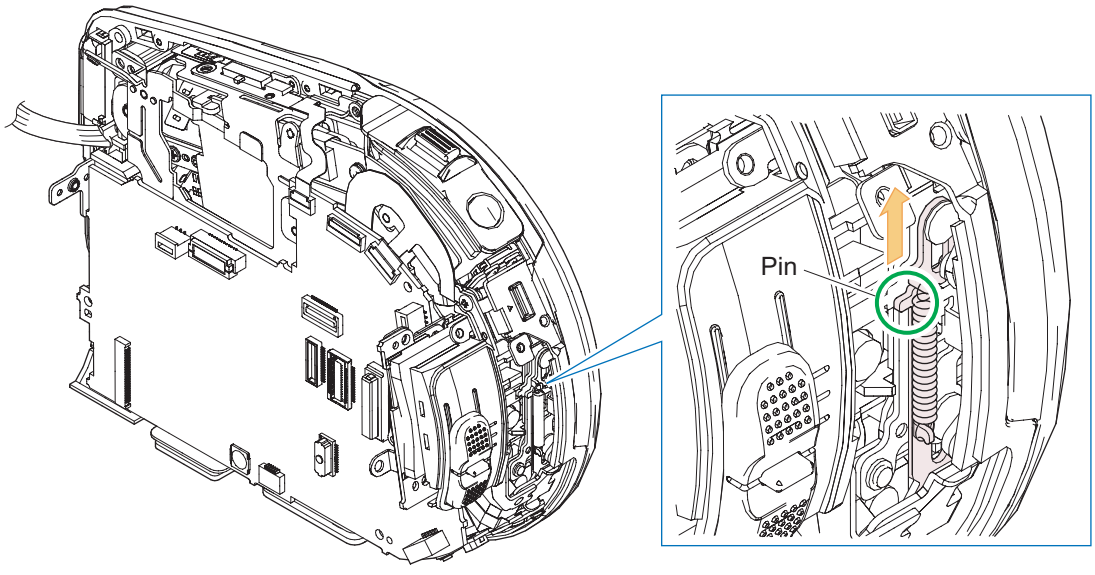


Fig. 12

2-5 Periodic Checkup and Maintenance of TS Mech Unit

Be sure to carry out the following maintenance and periodic inspection for ensuring full functional performance of the TS Mech unit. After repairing the mech unit, it is advisable to perform the cleaning of the pickup lens regardless of how long the unit has been used.

2-5-1 Cleaning of Pickup Lens

Open the Disc Cover and clean the pickup lens surface with an air blower commercially available.

* Do not use an air blower of spray-can type because blowing power is too strong.
* Do not touch the lens with bare hand.
* Do not perform the cleaning using lens-cleaning paper and alcohol for normal maintenance and checkup.

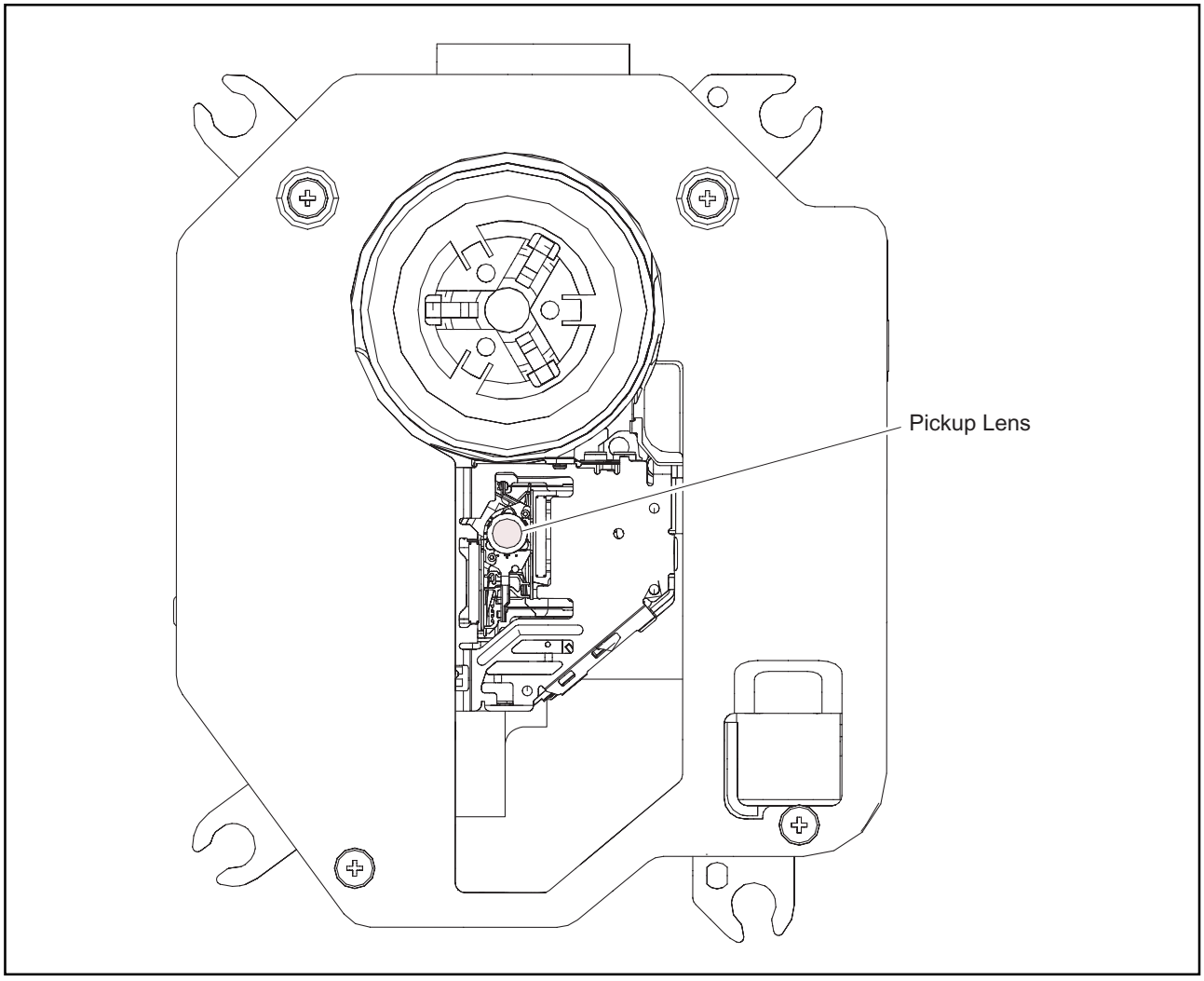


Fig. 13

2-6 Cleaning Inside of CVF Unit

<Hints>

The Dust Cover for the CVF Unit cannot be seen from the outside of the camera. For cleaning the inside of the CVF Unit, it is therefore required to remove its screws. After completion of repair, it is advisable to clean the inside of the CVF Unit regardless of the length of cumulative use time of the camera.

<Procedure>

(1) Remove the R Upper Cover, R-LCD Unit, and Rear Cover Unit.
(2) Using tweezers, detach the CVF Dust Cover.
(3) Clean the inside of the CVF Unit.

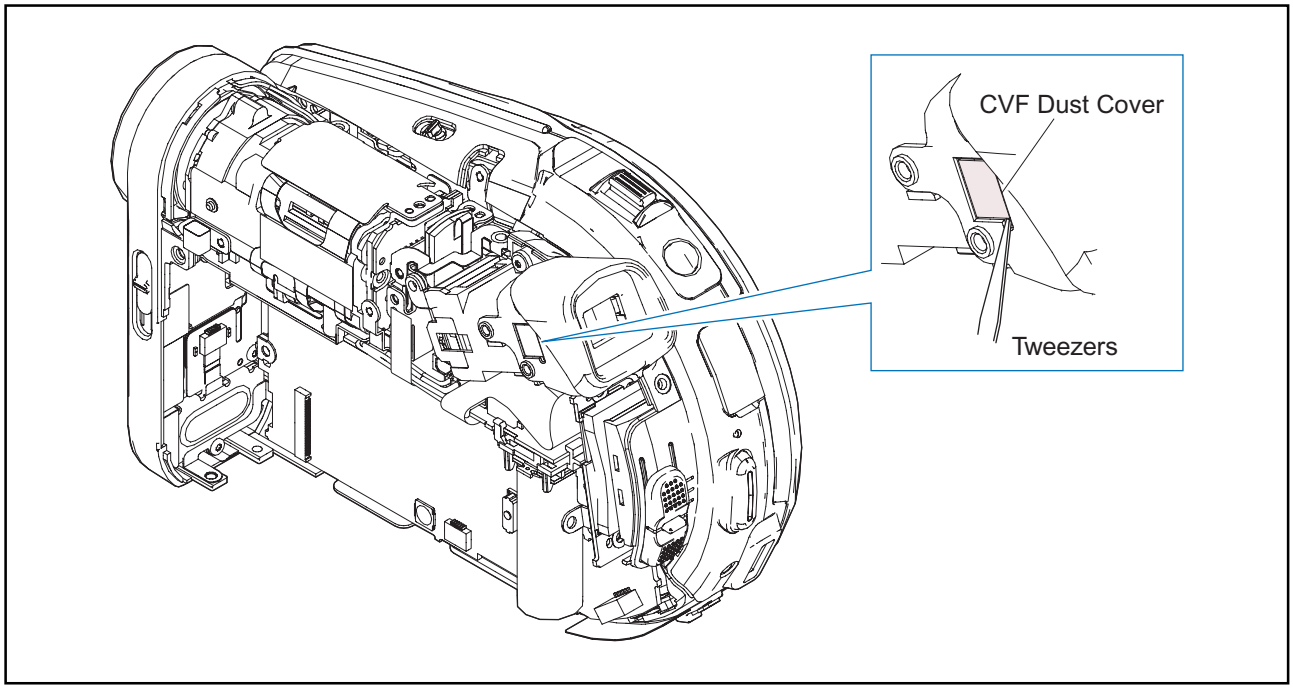


Fig. 14

2-7 Disposing of the Lithium Battery

When disposing this product, take out the internal lithium battery as follows. Regarding the disposal of the lithium battery, be sure to follow the industrial waste treatment regulations in your country.

2-7-1 How to Remove the Built-in Lithium Battery when Discarding the Video Camera

When discarding a video camera, remove the built-in lithium battery. Since there is a high-voltage generating section in the main unit, the work should be carried out after the power for the main unit has been left OFF for one and half months. Since there is danger of electrical shock from the DC20 E, read through the cautions in the procedure.

<Procedure>

1. Remove all the screws shown in the illustrations with a screwdriver.
   * The Cover (Center Cover Lid) is removed with tweezers. [P15 (9) -1)]

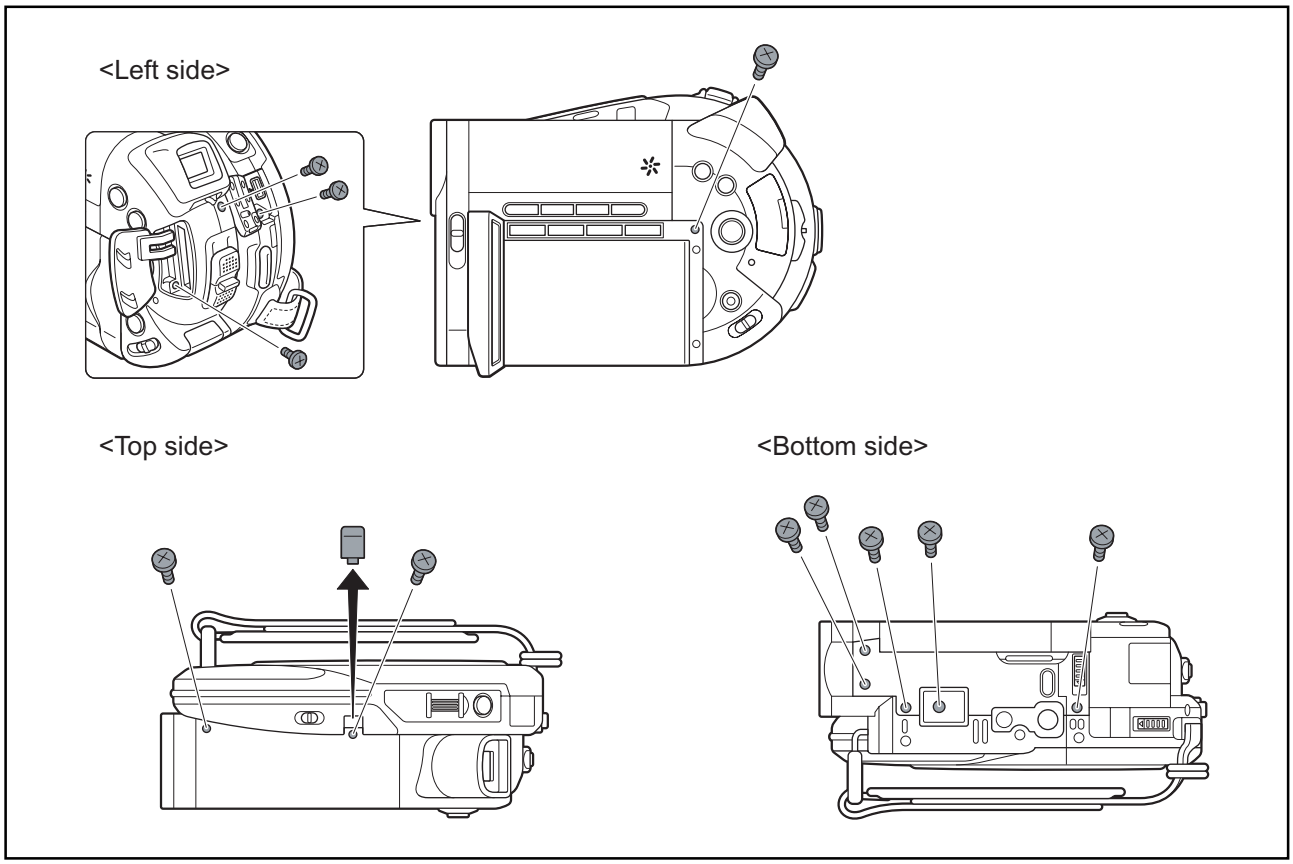


Fig. 15

2-1. Remove the top cover
2-2. Remove the additional screws under it.

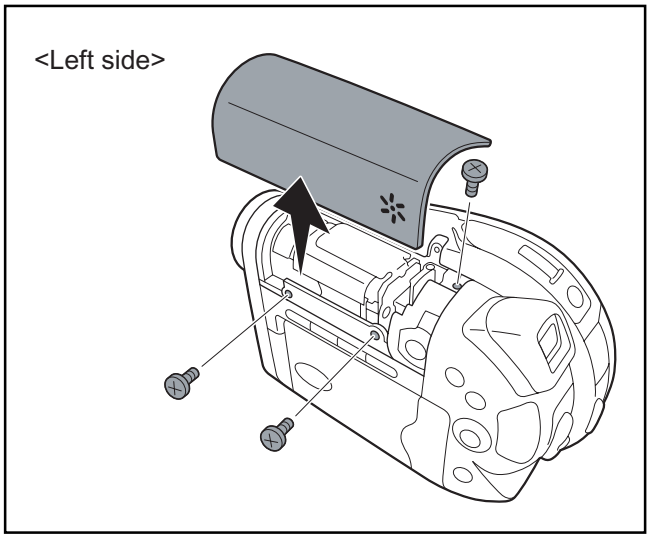


Fig. 16

3-1. Remove the LCD display cover and the back cover.
* Detach the cable connectors with a pair of long-nosed pliers or simply cut them with a pair of scissors.
3-2. Being careful not to touch the part indicated in the illustration remove the additional screws.

DC20 E **Touching the condenser can present a serious risk of electrical shock.**

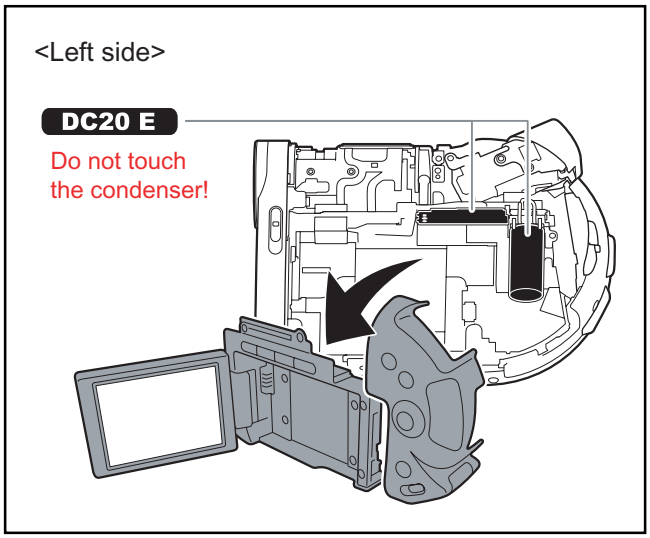


Fig. 17

4-1. Grab the battery firmly with an insulated pair of pliers or a similar tool and twist it repeatedly to detach it from the board (CARD PCB).
4-2. Be careful not to touch the part indicated in the illustration.

DC20 E **Touching the condenser can present a serious risk of electrical shock.**

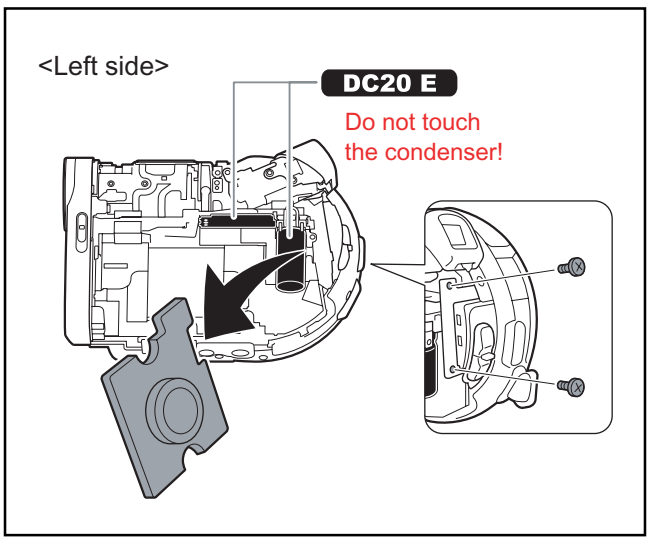


Fig. 18

2-8 Warning Displays

TEMPERATURE TOO HIGH CANNOT RECORD

- The temperature is too high.

TEMPERATURE TOO HIGH CANNOT REMOVE DISC

- When trying to remove the disc when the temperature was too high.

CANNOT RECORD

- When an error occurred on the disc, and recording cannot be performed.

REACHED THE MAXIMUM NUMBER OF SCENES

- When trying to shoot or perform another operation increasing the number of titles or chapters after the maximum has already been reached.

DISC FULL

- The disc has no free space, and movies and still images cannot be recorded.

CANNOT PLAY DISC

- When trying to play an incompatible disc in the player.

CANNOT EDIT DISC

- When trying to edit an unrecorded disc.

DISC IS FINALIZED

- When trying to finalize a disc that is already finalized.

DISC IS FINALIZED CANNOT RECORD

- When trying to record to a finalized disc.

UNFINALIZE THE DISC

- When trying to copy with PC when a finalized disc was recognized by DVD-Video.

UNABLE TO RECOVER DATA

- When corrupted data cannot be recovered.

UNABLE TO RECOVER DATA FORMAT THE DISC

- When corrupted data cannot be recovered.

DISC IS PROTECTED

- When trying to record to a write-protected disc.

DISC ERROR

- When a disc cannot be recognized.

ACCESS ERROR

- When an error occurred during reading process.

DISC COVER IS OPEN

- When the disc cover is open

NO DISC

- When no disc is loaded.

NO CARD

- When no card is loaded.

LOADING THE DISC

- Loading

DISC ERROR

- When an error occurred in the disc and recording cannot be performed.

OPENING THE DISC COVER

- Eject operation

COPYRIGHT PROTECTED DUBBING RESTRICTED

- When trying to record external input images recorded with copyright protection information to a card.

SET THE TIME ZONE, DATE AND TIME

- When the power has been turned on without setting the time zone and/or date and time.

CHANGE THE BATTERY PACK

- When the battery charge level has dropped.

CARD ERROR

- When an error occurred in the card and recording cannot be performed.

CARD FULL

- When the available space on the card is low.

NAMING ERROR

- When the file number and directory number have reached the maximum.

UNIDENTIFIABLE IMAGE

- When you tried to play an unplayable image type, incompatible JPEG image, or image with corrupted data.

PRINT ORDER ERROR

- When there are too many print marks (100 or more), or when a mark file cannot be edited.

NO CARD

- When the card is not inserted in the socket of the main unit.

NO IMAGES

- When the image that should be played in the card cannot be found.

IN CARD POSITION

- When pressing the Start/Stop button in Camera mode.

THIS IMAGE CANNOT BE RECORDED

- When analog input video that you are trying to record to a card cannot be recorded due to the signal condition.

PAPER ERROR

- When a paper error occurs.

NO PARER

- When the paper has not been inserted into the printer properly or there is no paper in the printer.

PAPER JAM

- When a paper jam occurs during printing.

NO INK

- When ink does not adhere properly or the ink has run out.

LOW INKLEVEL

- When the ink level is low.

WASTE TANK FULL

- When the waste ink tank is full.

CANNOT PRINT!

- When you tried to print a different type of still image or one recorded by another device, or a still image imported to and edited on a computer.

COULD NOT PRINT * IMAGES

- When you tried to print a different type of still image or one recorded by another device, or a still image imported to and edited on a computer using the DPOF setting for * images.

SET PRINT ORDER

- When you tried to print still images not designated for printing by using the Print command in the Card Playback menu.

CANNOT TRIM

- When you tried to trim still images with an image size of 160 × 120. Or, when you tried to trim a video where the aspect ratio deviates significantly from 4:3.

READJUST TRIMMING

- When you tried to change the “STYLE” setting after making the trimming settings.

PRINTER ERROR

- When a problem occurs in the printer.

COMMUNICATION ERROR

- When an error has occurred during communication.

PRINTER IN USE

- When the printer is in use. Check the printer status.

PRINTER WARMING UP

- When the printer is warming up.

PAPER LEVER ERROR

- When the printer paper lever is in the improper position.

PRINTER COVER OPEN

- When the printer cover is open.

INCOMPATIBLE PAPER SIZE

- When an unavailable paper size was selected in the paper size menu after displaying the paper size menu and changing the settings at the printer side.

CHECK PRINT SETTINGS

- When the printer setting status displays the current recording value and the PRINT/SHARE button was pressed even though this value cannot be used by PictBridge when the printer is connected.

PRINT ERROR

- When an error due to some unspecified cause occurred in the printer.

TRANS ORDER ERROR

- When the image quantity that can be set was exceeded.

TOO MANY STILL IMAGES DISCONNECT CABLE

- Disconnect the USB cable, delete the still images from the memory card until there are 1800 or less, and then reconnect the USB cable.

CANNOT TRANSFER!

- When “PC Background” is set, and then video is displayed (Setting icon and icon to its right are grayed out, and the PRINT/SHARE button lights up), and the PRINT/SHARE button is pressed.

PAPER HAS BEEN CHANGED

- When the paper size was changed between the time of selecting the paper and starting printing.

MEDIA TYPE ERROR

- When a paper that cannot be used is selected.

INCOMPATIBLE PAPER SIZE

- When paper that is incompatible with this device was loaded into the printer.

RECHARGE THE PRINTER BATTERY

- When the printer battery is out of power.

PAPER AND INK DO NOT MATCH

- When the ink cannot be used on the designated paper.

INK CASSETTE ERROR

- When an error has occurred in the ink cassette.

OPERATION CANCELED

- Duaring one-touch dubbing(disc copy) : When the operation was canceled the from the computer

BLOCK DIAGRAMS

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INTERCONNECTION DIAGRAM

BLOCK DIAGRAMS
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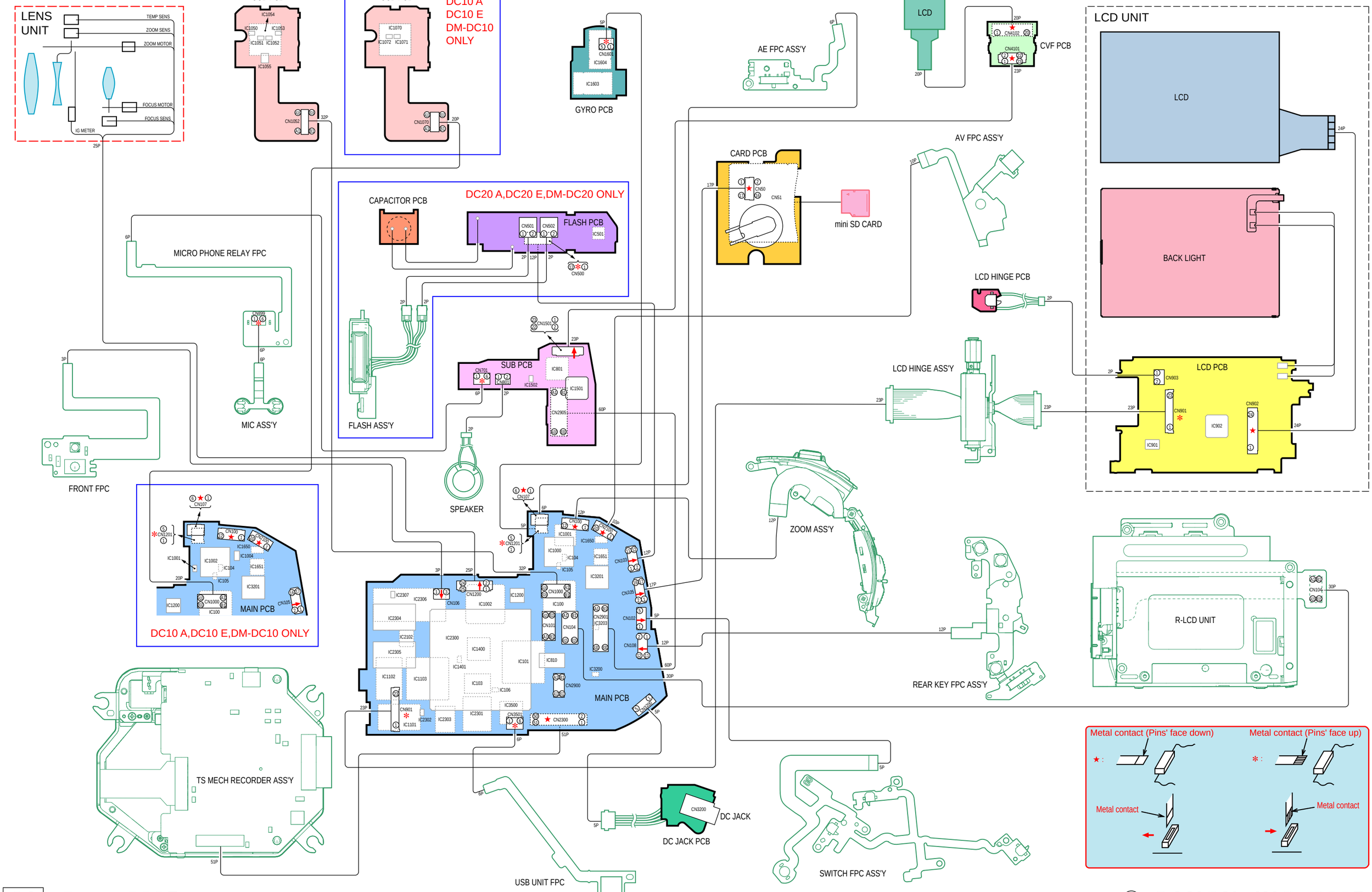
- SYSTEM CONTROL SECTION
- AUDIO-VIDEO SECTION
- POWER SUPPLY SECTION
- FLASH PCB SECTION (DC20 A,DC20 E,DM-DC20 ONLY)
- LCD PCB SECTION
- CARD/LI, DC JACK PCB SECTION
- FPC SECTION

INTERCONNECTION DIAGRAM

DC10 E,DC20 E



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INTERCONNECTION DIAGRAM

MAIN PCB

CN100

1	AVDD2.7V
2	ZOOM AD
3	GND
4	PHOTO SW
5	H PHOTO SW
6	DVDD3.3V
7	D ACC LED
8	GND
9	START/STOP SW
10	GND
11	CAM POW SW
12	VTR POW SW

CN101

A1	DVDD2.5/1.4V
A2	VTR ON
A3	SDI DINT
A4	SDAO TPC
A5	CCM RESET
A6	GND
A7	PCST3
A8	PCST2
A9	PCST1
A10	PCST0
A11	TRST
A12	TMS
A13	TDI
A14	TDO
A15	TCK
B1	DBGE
B2	DCLK
B3	DRESET
B4	SYSRDY
B5	DEBCLK
B6	GND
B7	DEBUD
B8	DEBDD
B9	XDEBEN
B10	TBUSY
B11	GND
B12	DVDD3.3V
B13	XRESET
B14	DBI
B15	PRI TDO

CN102

1	GND
2	EJECT SW
3	MOT POSI
4	MOTOR GND
5	MOTOR GND
6	MOTOR SIG
7	MOTOR SIG
8	OPEN Z
9	OPEN LOW
10	GND

CN103

1	ST UNREG
2	ST UNREG
3	ST UNREG
4	ST EFCHG
5	ST TMG(0)
6	ST VDHGL(0)
7	ST GND
8	ST GND
9	ST GND
10	ST GND
11	P5V
12	P5V

CN104

A1	
A2	
A3	
A4	PANEL OPEN SW
A5	GND
A6	KEY AD1
A7	KEY AD0
A8	GND
A9	GND
A10	
A11	
A12	BATT TEMP
A13	BATT INFO D
A14	BATT INFO B+
A15	BATT+
B1	BATT−
B2	BATT−
B3	BATT−
B4	BATT−
B5	BATT−
B6	BATT−
B7	BATT−
B8	BATT−
B9	BATT+
B10	BATT+
B11	BATT+
B12	BATT+
B13	BATT+
B14	BATT+
B15	BATT+

CN105

1	LI POW
2	GND
3	GND
4	GND
5	CARD DAT2
6	CARD DAT3
7	CARD CMD
8	GND
9	CARD VSS
10	CARD CLK
11	GND
12	CARD DAT0
13	CARD DAT1
14	GND
15	CARD VDD
16	CARD DET
17	CARD DET

CN106

1	GND
2	WHITE LED
3	WHITE LED
4	P5V
5	P5V
6	RMC IN

CN107

1	GND
2	AUTO
3	P
4	SCN
5	DEW−
6	DEW+

CN108

1	CARD MODE SW
2	STILL MODE SW
3	
4	KEY AD4
5	DIRECT P LED
6	P5V
7	VTR UNREG
8	CHAR CARD ACC LED
9	KEY AD3
10	KEY AD2
11	GND
12	GND

MAIN PCB

CN901

1	LCD BT SW
2	LCD BL VFB
3	LCD BL POW
4	LCD BL POW
5	GND
6	GND
7	R OUT(R−Y)
8	G OUT(Y)
9	B OUT(B−Y)
10	GND
11	GND
12	GND
13	NC
14	LCD3.3V
15	LCD3.3V
16	LCD5V
17	LCD8.5V
18	LCD CS
19	LCD EE CS
20	TX1 DAT
21	SCLK1
22	RX1 SIN
23	LCD ON

CN1000

A1	GND
A2	VOUT2
3	GND
A4	RG2
A5	GND
A6	LH2
A7	H2
A8	GND
A9	H1
A10	LH1
A11	GND
A12	RG1
A13	GND
A14	3.5V
A15	VOUT1
A16	GND
B1	GND
B2	S1
B3	S2
B4	V4B
B5	V4A
B6	V3B
B7	V3A
B8	V2B
B9	V2A
B10	V1B
B11	V1A
B12	SUB
B13	RC SUB
B14	CCD −7V
B15	CCD 15V
B16	GND

CN1200

1	FOCUS DRIVE−
2	FOCUS DRIVE+
3	CND
4	CND
5	IG HALL IN+
6	IG HALL OUT+
7	IG HALL IN−
8	IG HALL OUT−
9	GND
10	IG DRIVE−
11	IG DRIVE+
12	GND
13	L TEMP 2.7V
14	L TEMP
15	ZOOM LED
16	ZOOM SENS
17	ZOOM VCC
18	FOCUS GND
19	FOCUS ANAB
20	FOCUS ANAA
21	FOCUS VCC
22	ZOOM A
23	ZOOM B
24	ZOOM A
25	ZOOM B

CN1201

1	GY GND
2	Y GY OUT
3	GY GND
4	P GY OUT
5	AVDD2.7V

MAIN PCB

CN2100

1	AV GND
2	AV L I/O
3	AV R I/O
4	AV GND
5	AVS DET
6	V
7	YC GND
8	D
9	YC GND
10	Y

CN2300

1	DSW1
2	M/S
3	+UNREG
4	GND
5	+UNREG
6	POW ON
7	GND
8	GND
9	GND
10	GND
11	+UNREG
12	+UNREG
13	+UNREG
14	REMI
15	DASP−
16	CS3FX−
17	CS1FX−
18	HA2
19	HA0
20	PDIAG−
21	HA1
22	IOCS16−
23	INTRQ
24	DMACK−
25	IORDY
26	GND
27	DIOW−
28	DIOR−
29	GND
30	DMARQ
31	DD0
32	DD15
33	DD1
34	DD14
35	DD2
36	DD13
37	DD3
38	DD12
39	DD4
40	DD11
41	DD5
42	DD10
43	DD6
44	DD9
45	DD7
46	DD8
47	RESET−
48	OPEN Z
49	REMO
50	OPEN LOW
51	SHOCK

CN2900

A1	V I/O
A2	GND
A3	VTR POW SW
A4	SUB FCH
A5	CAM POW SW
A6	FCH 0
A7	EVF R
A8	EVF G
A9	N.C.
A10	GND
A11	REMI
A12	REMO
B1	V I/O
B2	EVF HD
B3	GND
B4	VTR UNREG
B5	MIC2
B6	MIC3
B7	EVF COM AC
B8	EVF B
B9	EVF COM DC
B10	GND
B11	RS232C RX2
B12	RS232C TX2

MAIN PCB

CN2901

A1	AA GND
A2	AV L I/O
A3	AA GND
A4	AV R I/O
A5	AV GND
A6	EXT DET
A7	SOUND
A8	GND
A9	G OUT(Y)
A10	R OUT(R−Y)
A11	B OUT(B−Y)
A12	GND
A13	GND
A14	A MUTE
A15	EVF COM DC
A16	EVF COM AC
A17	SCLK1
A18	GND
A19	WCK
A20	AMCK
A21	GND
A22	LRCK
A23	AUD PLL TO AIF
A24	AUD AIF TO MACS
A25	GND
A26	LCD8.5V
A27	LCD5V
A28	GND
A29	GND
A30	GND
B1	GND
B2	EVF G
B3	EVF R
B4	EVF B
B5	GND
B6	GND
B7	SOUND EN
B8	AIF CS
B9	PTOM/AIF DATA
B10	PTOM/AIF SCK
B11	REC MUTE
B12	GND
B13	XPDI
B14	EVF BL ON
B15	EVF ON
B16	EVF HD
B17	EVF CS
B18	TX1 DAT
B19	AA4.7
B20	AA2.7
B21	GND
B22	SP GND
B23	SP GND
B24	LCD3.3V
B25	LCD3.3V
B26	P5V
B27	P5V
B28	GND
B29	GND
B30	GND

CN3200

1	JACK DET
2	DC+
3	DC+
4	DC−
5	DC−

CN3501

1	VBUS
2	GND
3	D−
4	GND
5	D+
6	GND

CARD PCB

CN50

1	CARD DET
2	CARD VDD
3	GND
4	CARD DAT1
5	CARD DAT0
6	GND
7	CARD CLK
8	CARD VSS
9	GND
10	CARD CMD
11	CARD DAT3
12	CARD DAT2
13	GND
14	
15	GND
16	LI POW(+)
17	LI POW(+)

CN51

1	CD/DAT3
2	CMD
3	VSS1
4	VDD
5	CLK
6	VSS2
7	DAT0
8	DAT1
9	DAT2
10	NC1
11	NC2
12	CARD DET
13	COM
14	G3
15	G4
16	G1
17	G2

GYRO PCB

CN1601

1	AVDD2.7V
2	P GY OUT
3	GY GND
4	Y GY OUT
5	GY GND

SUB PCB

CN701

1	MECHA GND
2	INT MIC L
3	INT MIC GND L
4	INT MIC R
5	INT MIC GND R
6	MECHA GND

CN801

1	SP−
2	SP+

CN1501

1	BL2.7V
2	P5V
3	COM
4	PSIG
5	CS
6	GREEN
7	RED
8	BLUE
9	PCG
10	ENB
11	VCK
12	VST
13	XSTB
14	REF
15	WIDE
16	SCAN
17	HCK1
18	HCK2
19	HST
20	VSSG
21	VSS
22	VDD
23	VDD

CN2905

A1	AA GND
A2	AV L I/O
A3	AA GND
A4	AV R I/O
A5	AV GND
A6	TX PORT PP6
A7	SOUND
A8	GND
A9	G OUT(Y)
A10	R OUT(R−Y)
A11	B OUT(B−Y)
A12	GND
A13	GND
A14	A MUTE
A15	EVF COM DC
A16	EVF COM AC
A17	SCLK1
A18	GND
A19	WCK
A20	AMCK
A21	GND
A22	LRCK
A23	AUD PLL TO AIF
A24	AUD AIF TO MACS
A25	GND
A26	LCD8.5V
A27	LCD5V
A28	GND
A29	GND
A30	GND
B1	GND
B2	EVF G
B3	EVF R
B4	EVF B
B5	GND
B6	GND
B7	SOUND EN
B8	AIF CS
B9	PTOM/AIF DATA
B10	AIF SCK
B11	REC MUTE
B12	GND
B13	XPDI
B14	EVF BL ON
B15	EVF ON
B16	EVF HD
B17	EVF CS
B18	TX1 DAT
B19	AA4.7
B20	AA2.7
B21	GND
B22	SP GND
B23	SP GND
B24	LCD3.3V
B25	LCD3.3V
B26	P5V
B27	P5V
B28	GND
B29	GND
B30	GND

LCD PCB

CN901

1	LCD ON
2	RX1 SIN
3	SCLK1
4	TX1 DAT
5	LCD EE CS
6	LCD CS
7	LCD8.5V
8	LCD5V
9	LCD3.3V
10	LCD3.3V
11	NC
12	GND
13	GND
14	GND
15	B OUT(B−Y)
16	G OUT(Y)
17	R OUT(R−Y)
18	GND
19	GND
20	LCD BL POW
21	LCD BL POW
22	LCD BL VFB
23	LCD BT SW

CN902

1	TEST
2	RGT
3	BLUE
4	RED
5	GREEN
6	PSIG
7	HCK1
8	HCK2
9	WIDE
10	TEST
11	REF
12	HST
13	PCG
14	XSTBY
15	VSSG
16	N.C.
17	VSS
18	VDD
19	DWN
20	EN
21	VCK
22	VST
23	CS
24	COM

CN903

1	LCD BT SW
2	GND

CCD PCB

CN1052

A1	GND
A2	VOUT2
A3	GND
A4	RG2
A5	GND
A6	LH2
A7	H2
A8	GND
A9	H1
A10	LH1
A11	GND
A12	RG1
A13	GND
A14	3.5V
A15	VOUT1
A16	GND
B1	GND
B2	S1
B3	S2
B4	V4B
B5	V4A
B6	V3B
B7	V3A
B8	V2B
B9	V2A
B10	V1B
B11	V1A
B12	SUB
B13	RC SUB
B14	CCD −7V
B15	CCD 15V
B16	GND

CVF PCB

CN4101

1	VDD
2	VSS
3	VSSG
4	HST
5	HCK2
6	HCK1
7	SCAN
8	WIDE
9	REF
10	XSTB
11	VST
12	VCK
13	ENB
14	PCG
15	BLUE
16	RED
17	GREEN
18	CS
19	PSIG
20	COM
21	P5V
22	BL2.7V
23	BL2.7V

CN4102

1	COM
2	CKV1
3	CKV2
4	STV
5	XSTV
6	XENB
7	ENB
8	CSV
9	VBB
10	DSD
11	XDSG
12	DSG
13	B
14	R
15	G
16	CSH
17	VDD
18	CKH2
19	CKH1
20	VSS
21	STH
22	XSTH

DC10 A
DC10 E
DM-DC10 ONLY

MAIN PCB

CN1000

A1	GND
A2	CCD OUT
A3	GND
A4	GND
A5	H1
A6	H2
A7	GND
A8	RESET
A9	GND
A10	VH(+15V)
B1	GND
B2	CAM3.3V
B3	VL(−7.5V)
B4	VBUS
B5	SUB SW
B6	GND
B7	V1
B8	V2
B9	V3
B10	V4

DC10 A
DC10 E
DM-DC10 ONLY

CCD PCB

CN1070

A1	GND
A2	CCD OUT
A3	GND
A4	GND
A5	H1
A6	H2
A7	GND
A8	RESET
A9	GND
A10	VH(+15V)
B1	GND
B2	CAM3.3V
B3	VL(−7.5V)
B4	VBUS
B5	SUB SW
B6	GND
B7	V1
B8	V2
B9	V3
B10	V4

DC20 A
DC20 E
DM-DC20 ONLY

FLASH PCB

CN500

1	P5V
2	P5V
3	ST GND
4	ST GND
5	ST GND
6	ST GND
7	ST VDHGL
8	ST TMG
9	ST EFCHG
10	ST UNREG
11	ST UNREG
12	ST UNREG

CN501

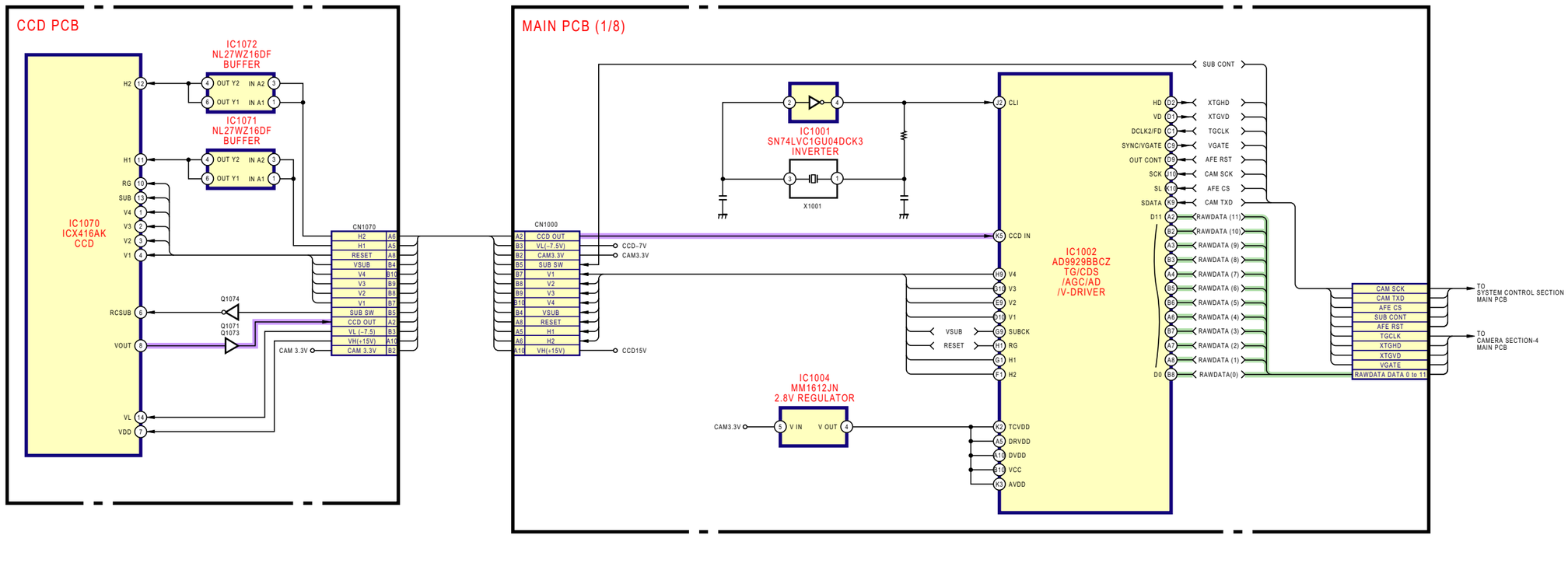
1	XE(+)
2	XE(−)

CN502

1	T(+)
2	T(−)

ANALOG VIDEO SIGNAL

DIGITAL VIDEO SIGNAL



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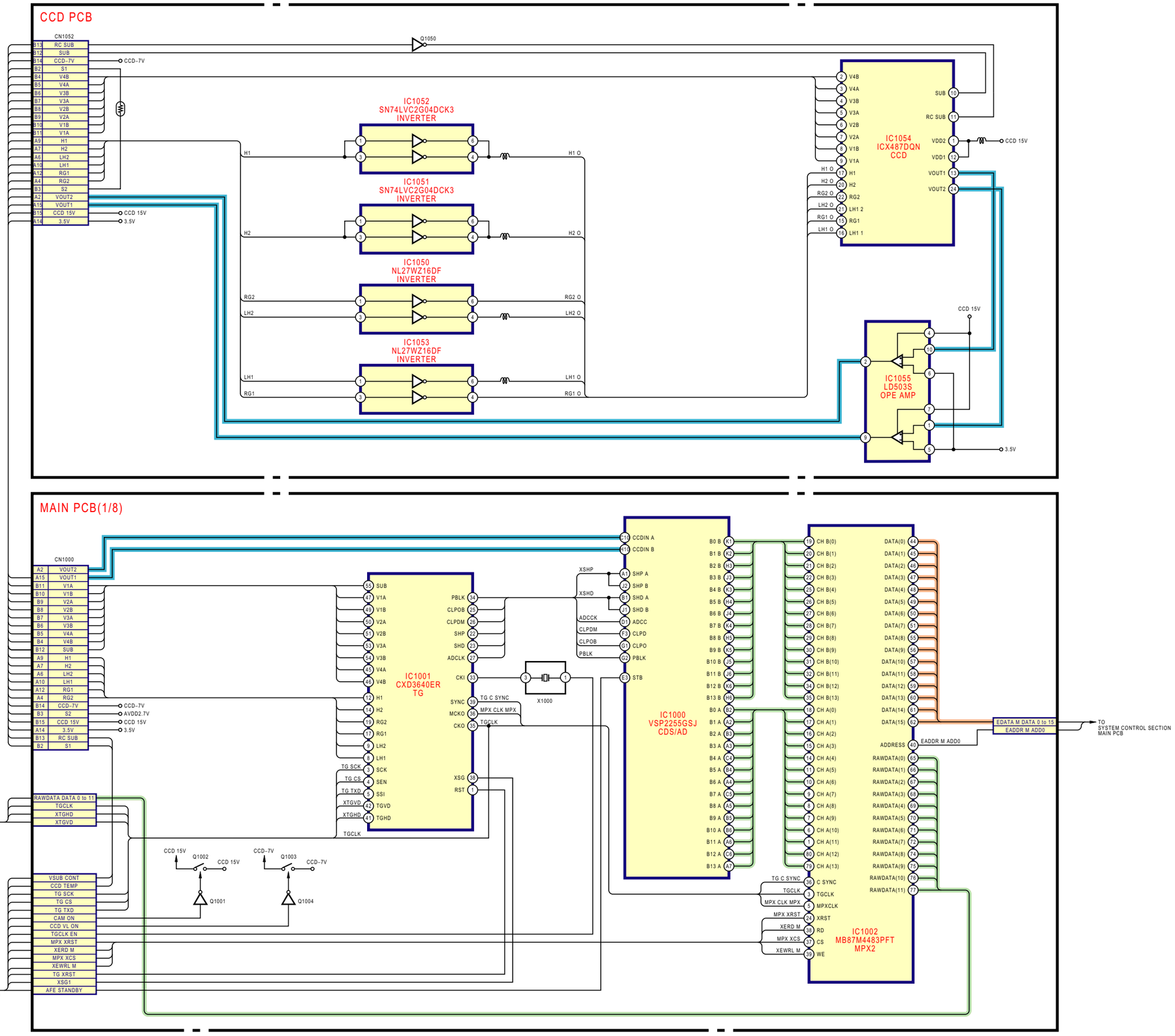
DIGITAL VIDEO SIGNAL CCD OUTPUT SERIAL DATA CPU BUS SIGNAL



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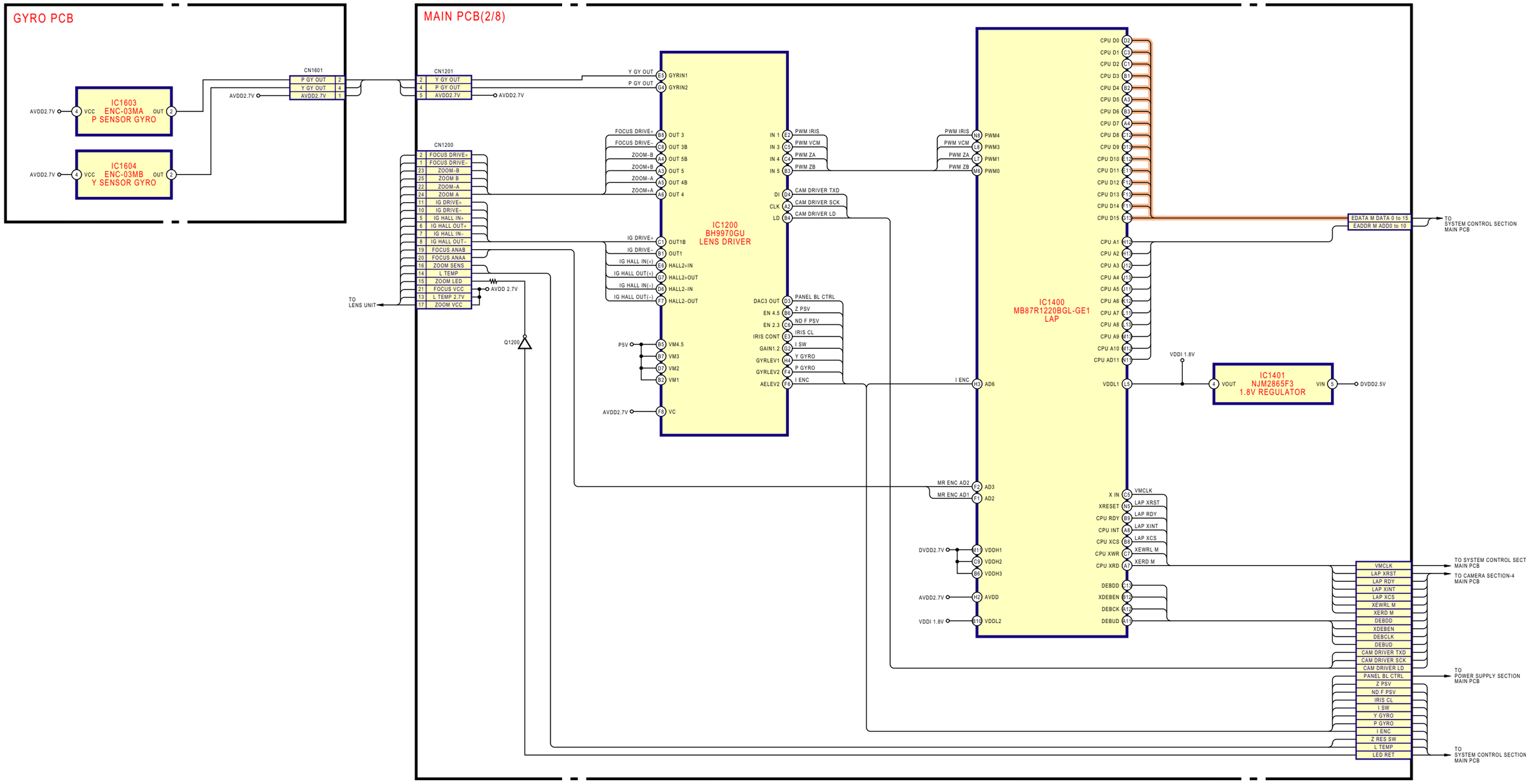
CPU BUS SIGNAL



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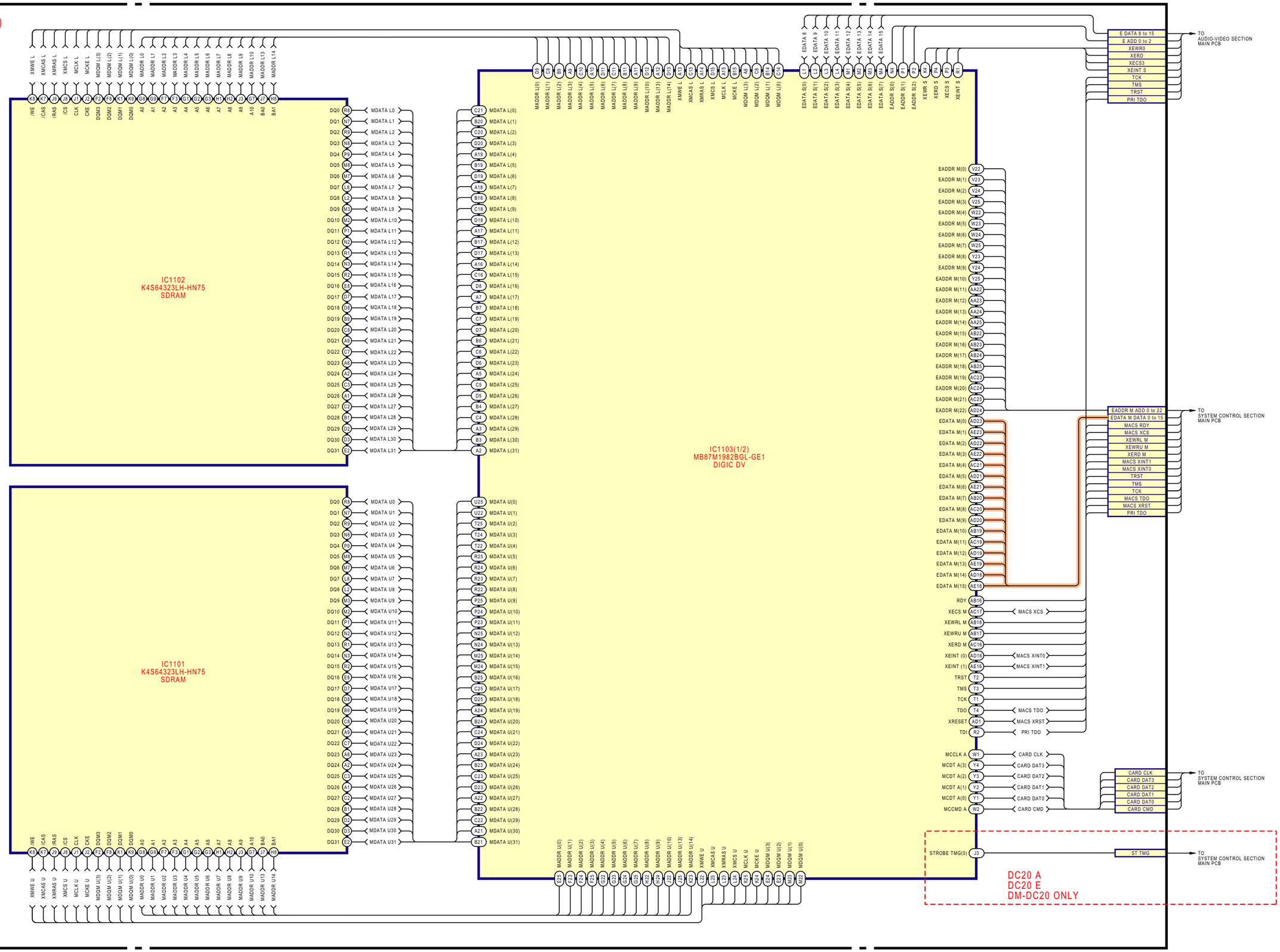
MAIN PCB(3/8)



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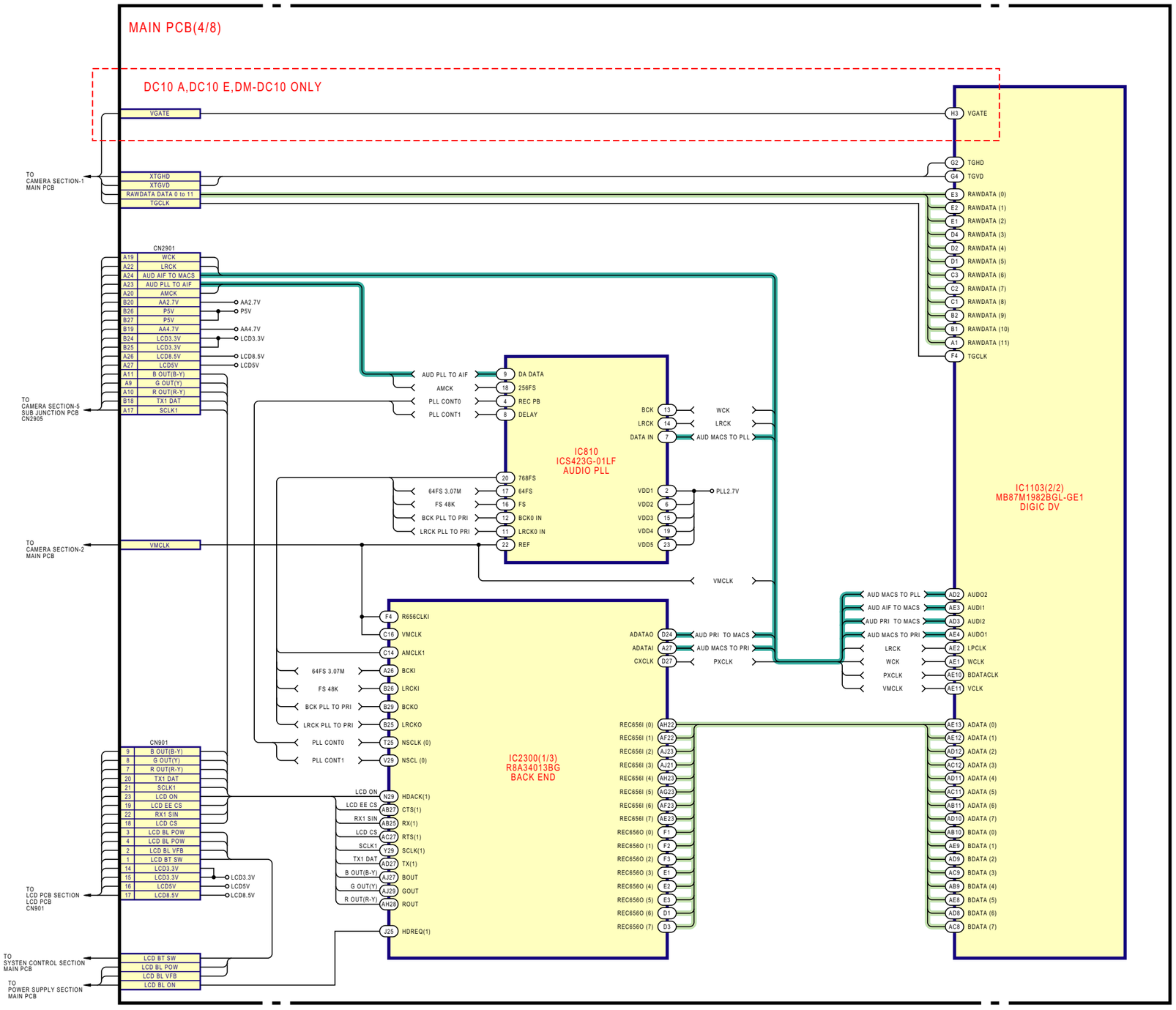
DIGITAL VIDEO SIGNAL DIGITAL AUDIO SIGNAL



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ANALOG AUDIO SIGNAL

DIGITAL AUDIO SIGNAL

CVF PCB

SUB PCB

LCD (CVF)

CN4102

1	VDD
8	WIDE
9	REF
4	HST
5	HCK2
6	HCK1
7	SCAN
10	XSTB
11	VST
12	VCK
13	PCG
14	ENB
15	BLUE
17	GREEN
18	CS
19	PSIG
20	COM
16	RED

Q4101

BACK-LIGHT

CN4101

P5V	21	23	BL2.7V
BL2.7V	22	9	REF
HST	4	5	HCK2
HCK1	6	7	SCAN
WIDE	8	10	XSTB
VST	11	12	VCK
PCG	14	15	BLUE
RED	16	17	GREEN
CS	18	19	PSIG
COM	20	13	ENB
VDD	1		

CN1501

16	SCAN
19	HST
17	HCK1
18	HCK2
6	GREEN
7	RED
8	BLUE
15	WIDE
14	REF
10	ENB
13	XSTB
12	VST
11	VCK
9	PCG
5	CS
3	COM
4	PSIG
1	BL2.7V
2	P5V
23	VDD
22	VDD

P5V

Q1504

LCD 8.5V

IC1501
CXM3009TQ
CVF DRIVER

13	RGT		
17	HST		
18	HCK1		
19	HCK2		
EVF G	35	G OUT	
EVF R	34	R OUT	
EVF B	33	B OUT	
16	WIDE		
42	REF		
22	EN		
20	XSTB		
24	VST		
23	VCK		
21	PCG		
39	COM		
38	COM-DC		
37	PSIG OUT		
39	VCCCOM		
EVF8.5V	47	VCC 2	
41	DA OUT		
26	POF		
		HDO	27
		B/B-Y	46
		G/Y	44
		R/R-Y	45
		SCK	7
		SDAT	8
		SEN	6
		VCC1-1	5
		VCC1-2	43
		VDD1	18
		VDD2	29
		VCC2	36

SCLK1

TX1 DAT

EVF CS

VCC5V

IC1502
NJM2865F3
2.8 REGULATOR

4 VOUT

VIN 5

Q1502

LCD 5V

Q1503

VCC 5V

CN2905

EVF HD	B16
EVF COM DC	A15
EVF G	B2
EVF R	B3
EVF B	B4
EVF COM AC	A16
B OUT(B-Y)	A11
G OUT(Y)	A9
R OUT(R-Y)	A10
SCLK1	A17
TX1 DAT	B18
EVF CS	B17
EVF ON	B15
LCD3.3V	B24
LDC3.3V	B25
A MUTE	A14
AV L I/O	A2
AV R I/O	A4
SOUND	A7
XPDI	B13
REC MUTE	B11
PTOM/AIF DATA	B9
AIF CS	B8
AIF SCK	B10
AMCK	A20
WCK	A19
LRCK	A22
AUD PLL TO AIF	A23
AUD AIF TO MACS	A24
AA2.7V	B20
P5V	B26
P5V	B27
AA4.7V	B19
LCD8.5V	A26
LCD5V	A27

TO AUDIO-VIDEO SECTION MAIN PCB CN2901

TO CAMERA SECTION-4 MAIN PCB CN2901

AA2.7V

P5V

AA4.7V

LCD8.5V

LCD5V

Q821

Q803

Q804

SPEAKER

CN801

2	SP+
1	SP-

CN701

4	INT MIC R
2	INT MIC L

TO MIC UNIT

AA4.7V

P5V

AA2.7V

MIC POWER

IC801
AK4567
AIF4

AUDIO I/F CONTROLLER

ALC1

HPF FIL1 FIL2 EQ FIL3

+2db to -2db

-24db +12db 0db

OVF DETECT

OFFSET CANCEL HPF

OFFSET CANCEL HPF

ADC

PRE AMP

PRE AMP

MIXER & DEM

DAC

OPGA

MIX

HP AMP

LINE OUT

CONTROL REGISTER I/F

ALC2

SPK AMP

SP+

SP-

LRCK

AMCK

WCK

AUD PLL TO AIF

AUD AIF TO MACS

PTOM/AIF DATA

AIF CS

PTOM/AIF SCK

REC MUTE

XPDI

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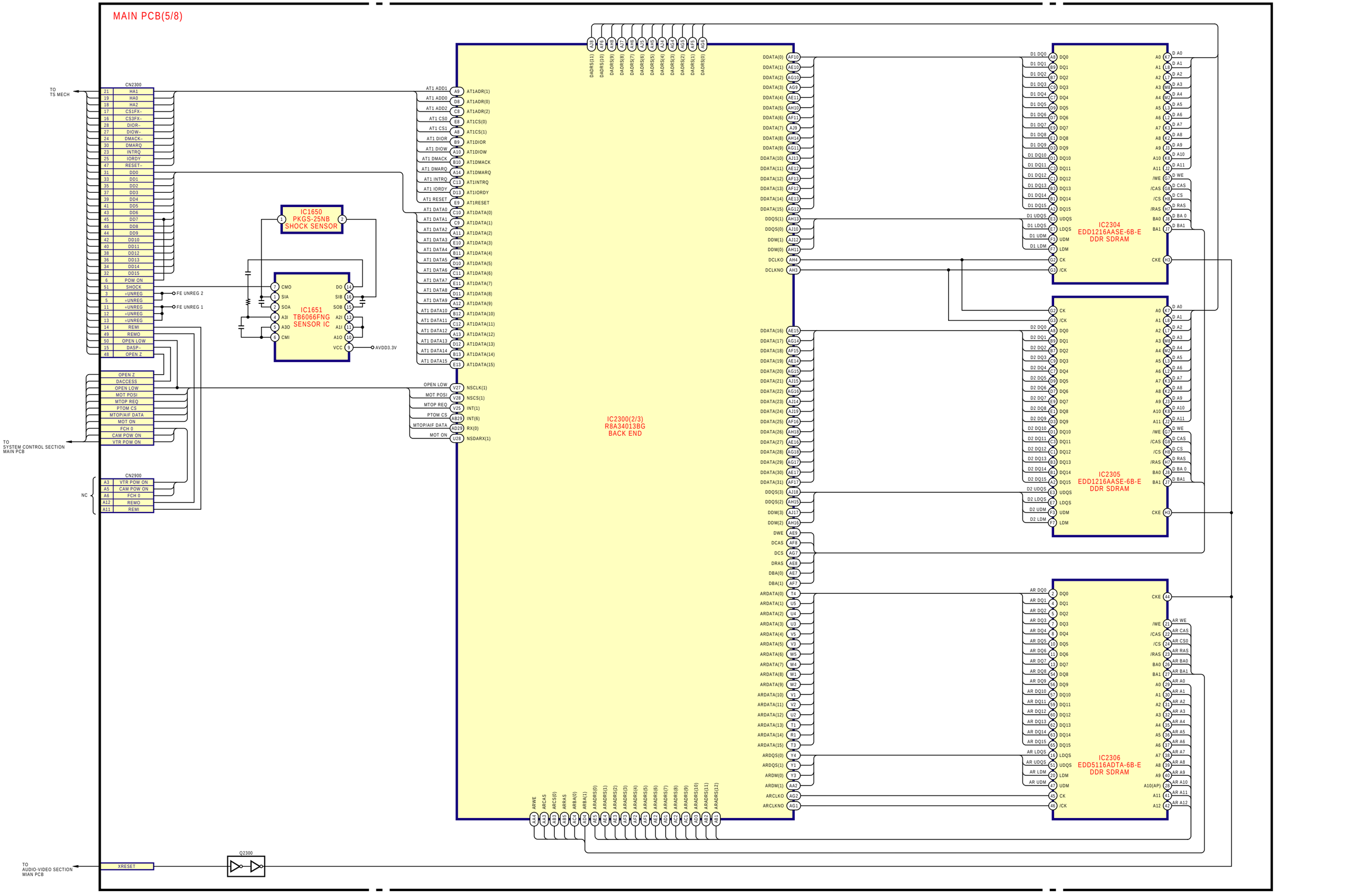
MAIN PCB(5/8)



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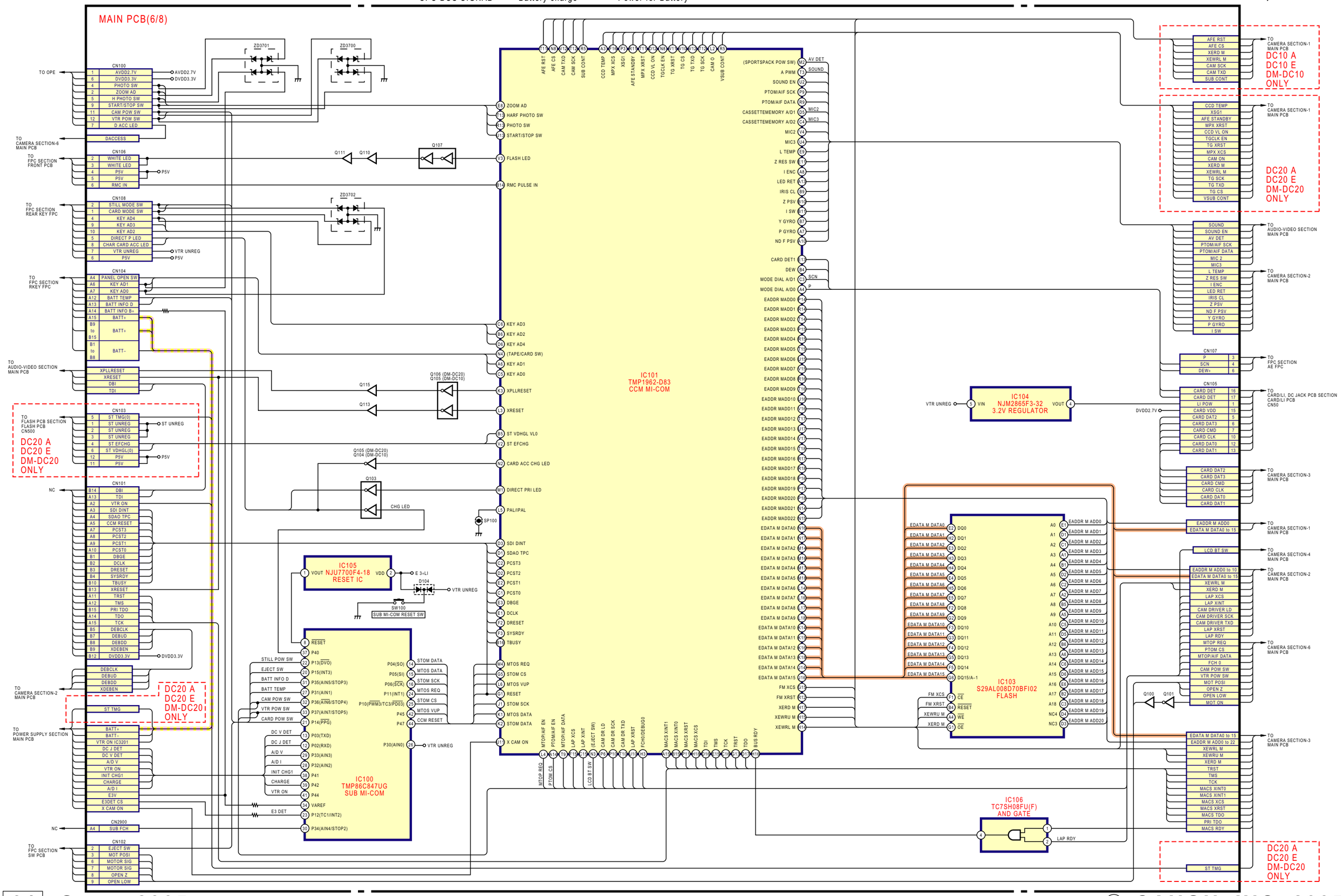
SYSTEM CONTROL SECTION

CPU BUS SIGNAL Battery charge Power for Battery

DC10 E, DC20 E

MAIN PCB(6/8)



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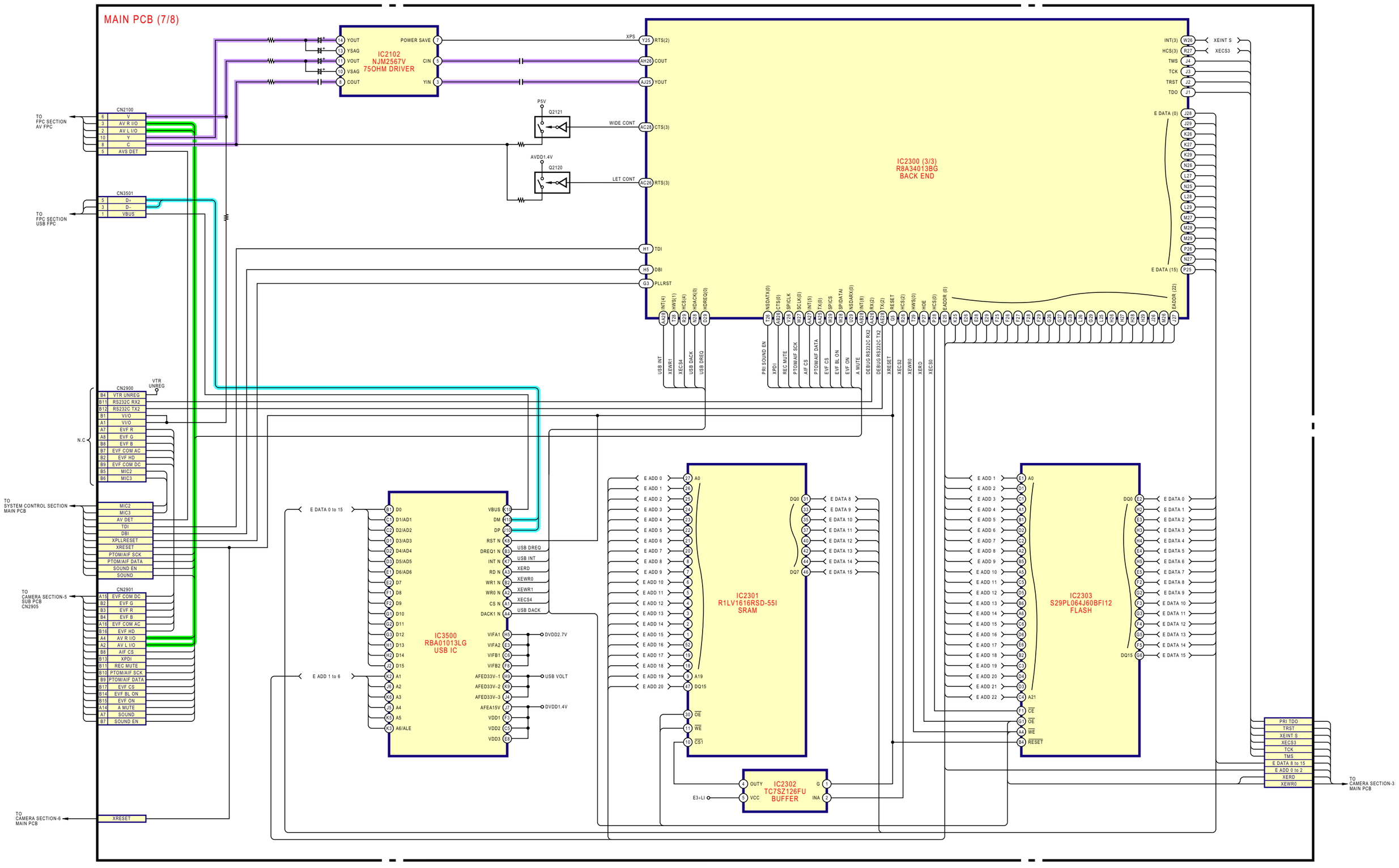
ANALOG AUDIO SIGNAL

ANALOG VIDEO SIGNAL

USB SIGNAL



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Power for Battery

Power for DC JACK

Battery charge

MAIN PCB(8/8)

DC20 A,DC20 E,DM-DC20 ONLY

FU3200 FU3205 FU3203 FU3201 FU3202 FU3204

ST UNREG

FE UNREG 1

FE UNREG 2

D1801

TO CARD/LI,DC JACK PCB SECTION DC JACK PCB

CN3200

2 DC +
3 DC +
4 DC –
5 DC –
1 JACK DET

FU1800

Q1802

TO SYSTEM CONTROL SECTION MAIN PCB

DC J DET
DC V DET
VTR ON
VTR ON IC3201
A/D I
CHARGE
INIT CHG1
ST TMG
E3DET CS
E3V
PANEL BL CTRL
LCD BL VFB
X CAM ON
A/D V

Q1803

TO CAMERA SECTION-2 MAIN PCB

BATT +
BATT –

TO CAMERA SECTION-4 MAIN PCB

LCD BL POW
LCD BL ON

Q3200

CHARGE

Q1804

Q1801

IC3201
MB44A126
DC/DC
CONVERTER
CONTROL

38 CTL 7
35 CTL 6
34 OSC
33
32 CTL
31 VCC1
48 VCC2
74 VCCO1
75 VCCO2
65 OUT 9
62 VCC3
A/DI 59 OUTC 9
CHARGE 64 CHRG CTL1
INIT CHG1 63 CHRG CTL2

DC20 A
DC20 E
DM-DC20
ONLY

ST TMG 47 CS OUT2
61 +INC9
60 –INC9
E3DET CS 46 CS OUT 1
LCD BL VFB 4 –INA
PANEL BL CTRL 3 +INA
E3V 51 VOUT 3
8
80 RT
29
37
16
17
19
18
12
77

CH1 23 68
CH2 22 70
CH7 9 78
CH8
CH5 13 76
CH4 73
CH3 72
CH6

Q3203
1.2V (CH1)

Q3205

Q3201
1.4V (CH2)

Q3211

Q3206
2.5V (CH7)

Q3202
2.7V (CH5)

Q3213
P5V (CH4)

Q3204
3.45V (CH3) (DM-DC20)
Q3204
3.3V (CH3) (DM-DC10)

Q3207

T3201

D3203

D3202

D3201

VTR UNREG

LPF PRISM 1.2V

DVDD 1.4V

MACS1.4V

LPF AVDD1.4V

DVDD 2.5V

DDR2.5V

SDRAM2.5V

LPF AA 2.7V

LPF HTQ2.7V

LPF CAM2.7V

DC20 A
DC20 E
DM-DC20
ONLY

DVDD2.7V

PLL2.7V

AVDD2.7V

IC3203
NJM2865F3-46
4.6V REGULATOR
V IN V OUT

AA4.7V

P 5V

LPF LCD 5V

DC20 A
DC20 E
DM-DC20
ONLY

IC3200
NJM2881F31
3.1V REGULATOR
V IN V OUT

USB VOLT
LCD3.3V
FLASH SRAM3.3V
DVDD3.3V
AVDD3.3V
CAM3.5V

DC10 A
DC10 E
DM-DC10
ONLY

USB VOLT
LCD3.3V
FLASH SRAM3.3V
DVDD3.3V
AVDD3.3V
CAM3.3V

CCD –7V

CCD 15V

LCD 8.5V

DC20 A
DC20 E
DM-DC20
ONLY

Q3208

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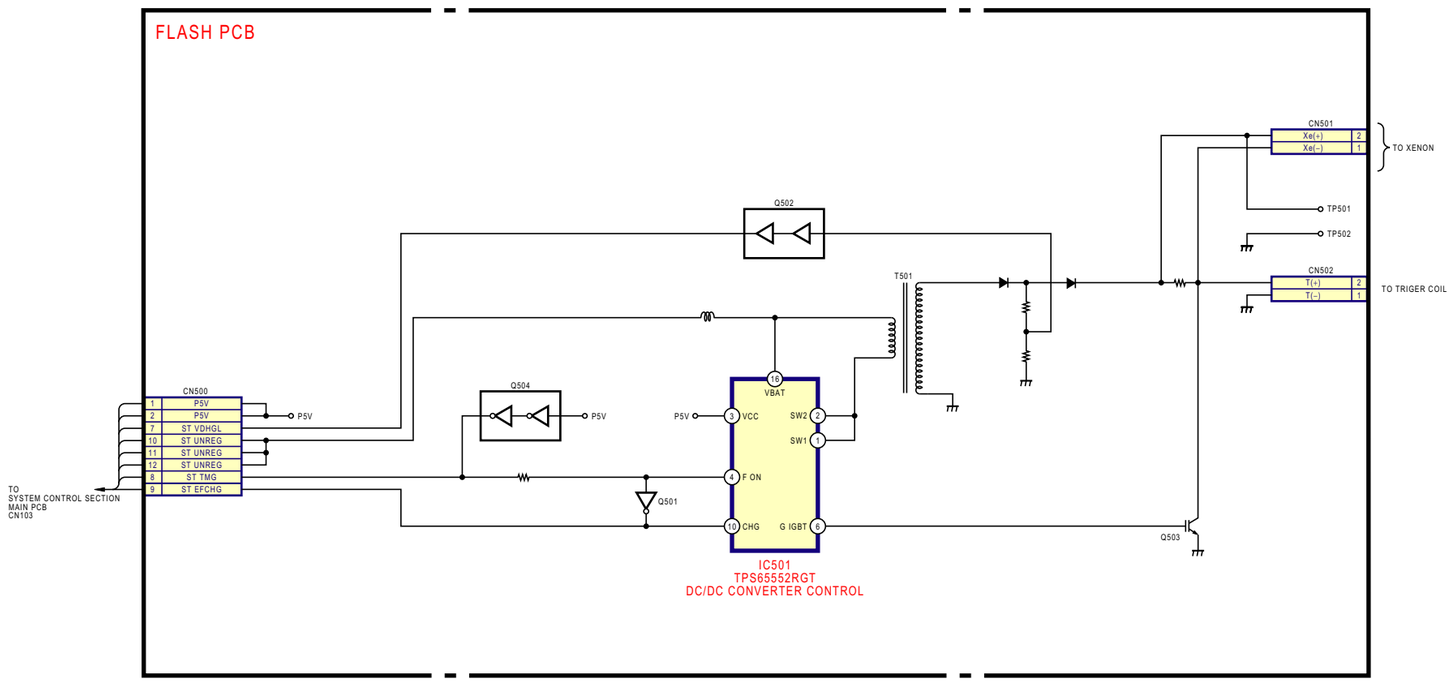

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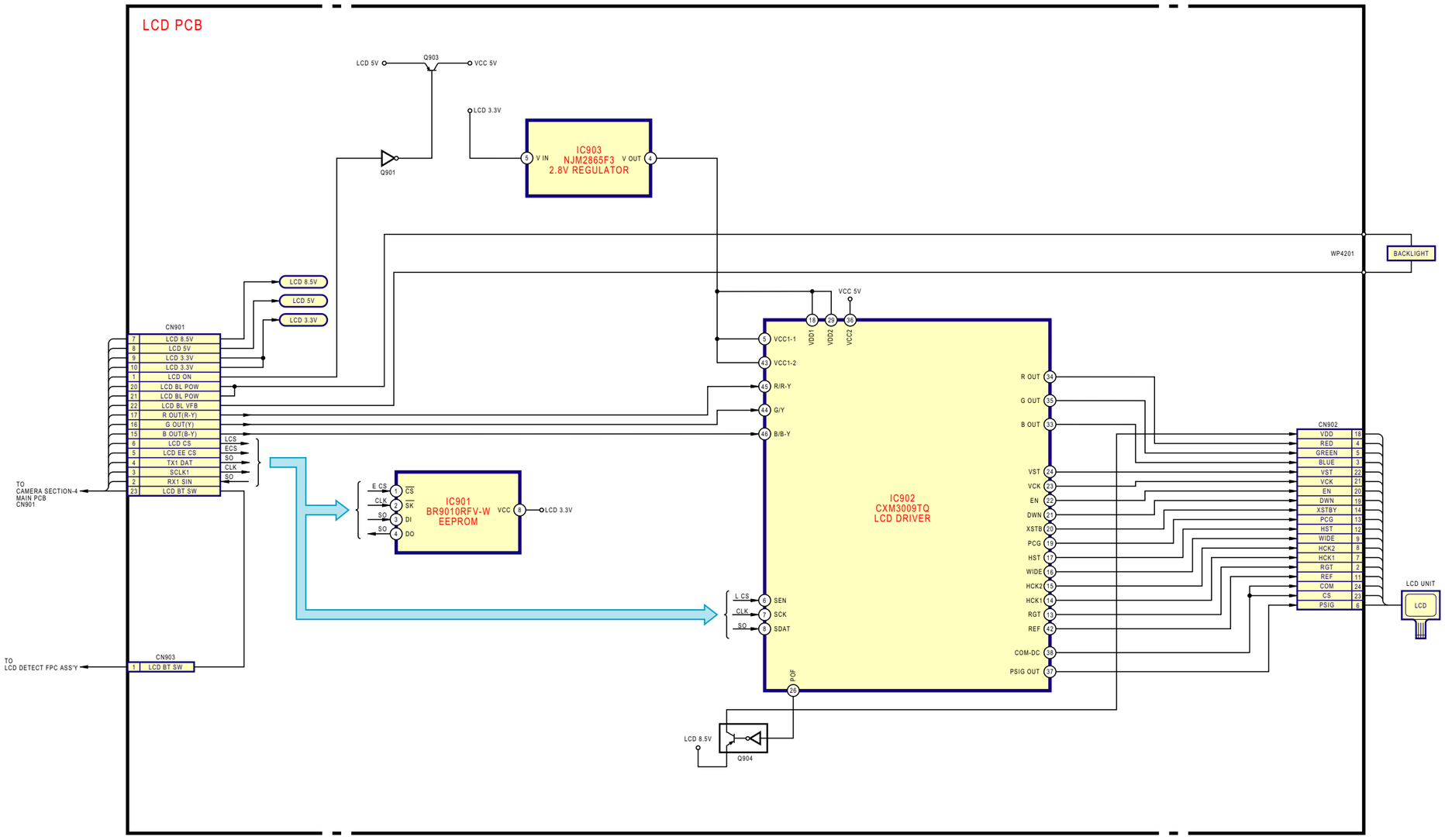
DATA COMMUNICATION



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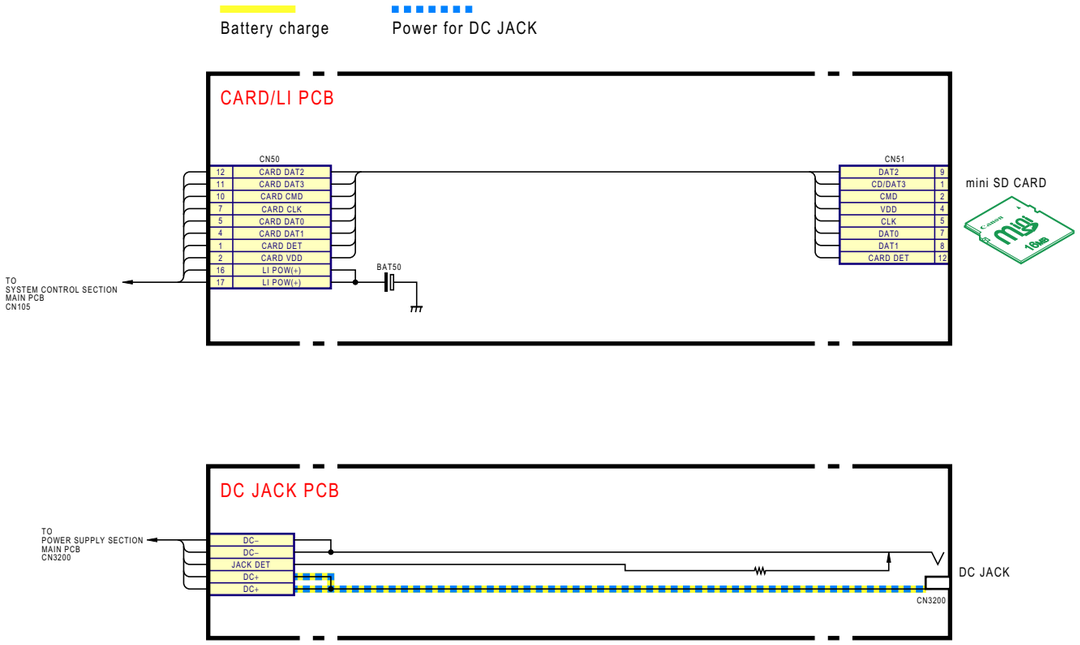

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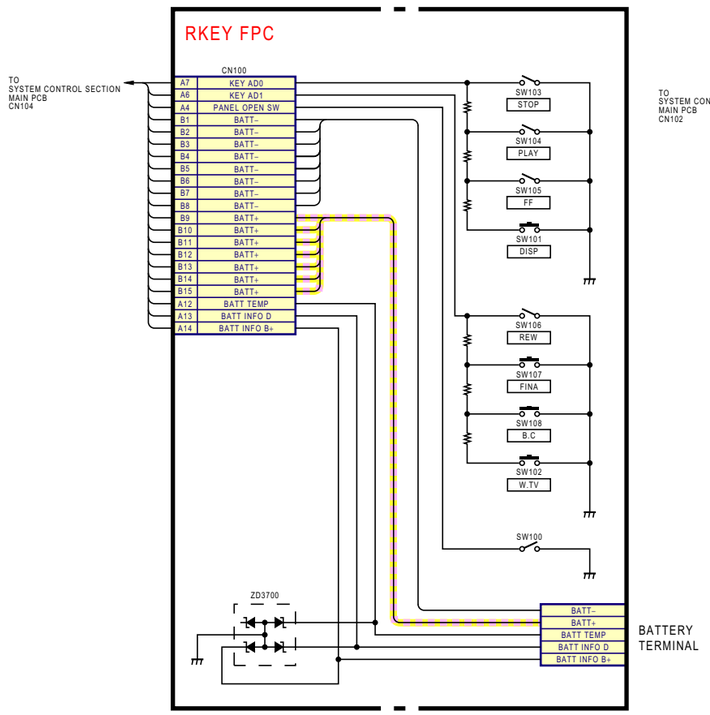
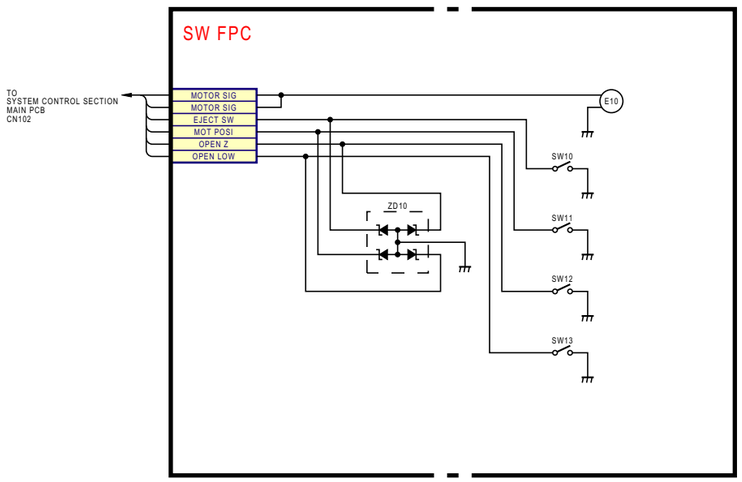
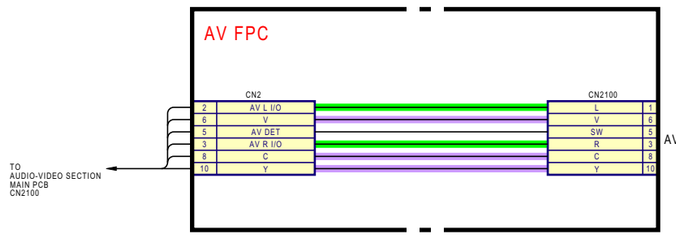
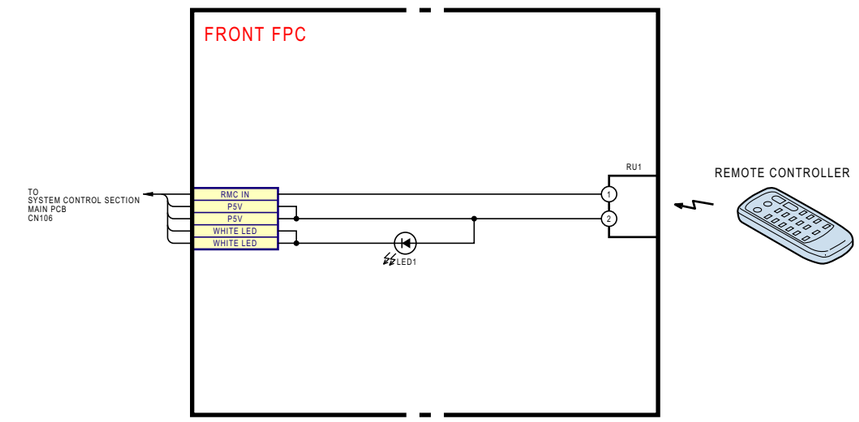
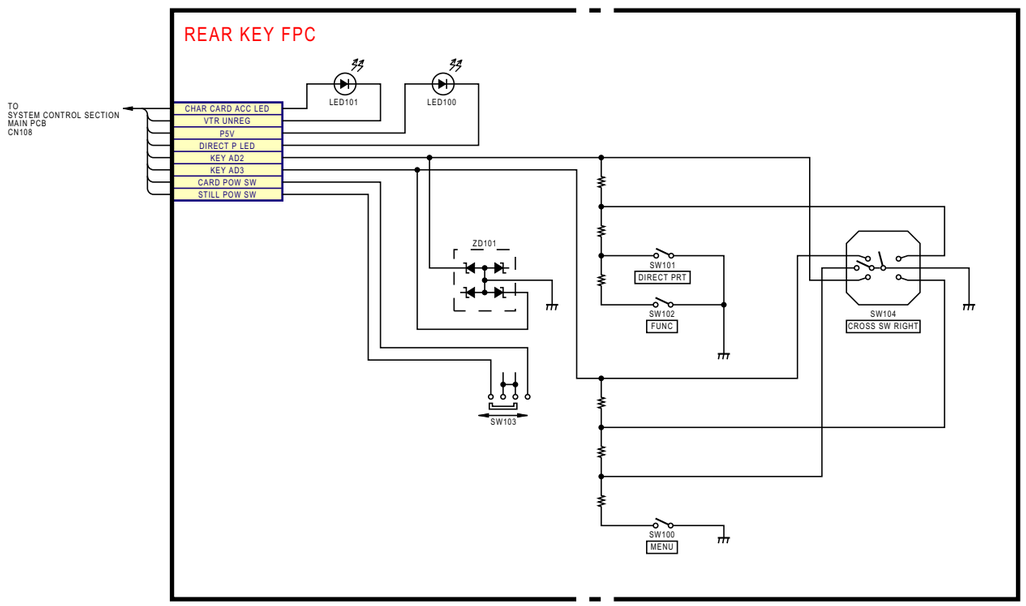
ANALOG VIDEO SIGNAL　ANALOG AUDIO SIGNAL　USB SIGNAL　Battery charge　Power for Battery

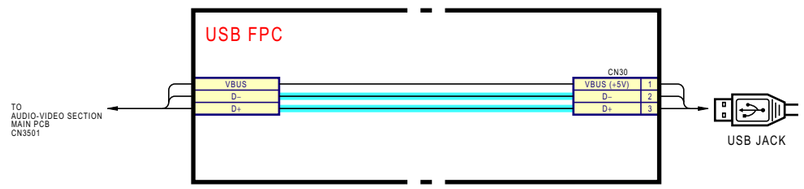


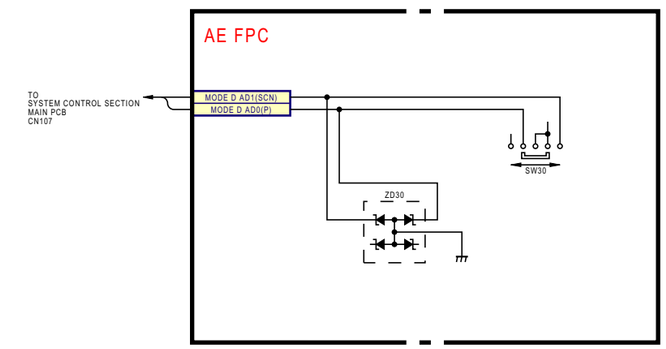












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